RAC2

EPA Region 2

Final Design Analysis Report

Old Roosevelt Field Contaminated
Groundwater Area Superfund Site
Garden City, New York

EPA Contract No. EP-W-09-002
WA 008-RDRD-02PE

September 18, 2009

Final Design Analysis Report
Old Roosevelt Field Contaminated Groundwater
Area Superfund Site
Garden City, New York
Work Assignment No.: 008-RDRD-02PE

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Acronyms

AGC	annual guideline concentration
bgs	below ground surface
CDM	CDM Federal Programs Corporation
cfm	cubic feet per minute
cis-1,2-DCE	cis-1,2-dichloroethene
DAR	Design Analysis Report
1,1-DCE	1,1-dichloroethene
DGW	discharge to groundwater
EPA	US Environmental Protection Agency, Region 2
EW	extraction well
FS	feasibility study
Ft	foot
ft/d	feet per day
ft/sec	feet per second
gpd/ft	gallons per day per foot
gpm	gallons per minute
GWTF	groundwater treatment facility
HDPE	high density polyethylene
HOA	Hand-off-automatic
hp	horsepower
H&S	health and safety
ITP	Initial Testing Program
lb	pound

lbs/d	pounds per day
MCL	maximum contaminant level
mg/L	milligram per liter
msl	mean sea level
NAPL	non-aqueous phase liquid
NCDPW	Nassau County Department of Public Works
NPL	National Priorities List
NYSDEC	New York State Department of Conservation
NYSDOH	New York State Department of Health
NYSPDES	New York State Discharge Pollutant Elimination System
OIT	Operator Interface Terminal
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PCE	tetrachloroethene
PLC	programmable logic controller
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAC	Response Action Contract
RD	Remedial Design
RDSGW	Remediation Discharge to Surface Water or Groundwater
RI	remedial investigation
ROD	Record of Decision
RVM	room vapor monitor

sf	square feet
sq.ft.	square foot
SGC	short-term guideline concentration
PCE	tetrachloroethene
TCE	trichloroethene
TAL	target analyte list
TCL	target compound list
the Site	Old Roosevelt Field Contaminated Groundwater Area Site
UFP	Uniform Federal Policy
UPS	uninterruptible power supply
U.S.	United States
USGS	United States Geological Survey
VFD	Variable Frequency Drive
VOCs	volatile organic compounds
µg/L	microgram per liter

1 Section One

Section 1
Introduction

1.1 Project Overview

This Design Analysis Report (DAR), prepared by CDM Federal Programs Corporation (CDM), presents the rationale and approach to achieve the requirements set forth in the United States Environmental Protection Agency's (EPA) September 2007 Record of Decision (ROD) (EPA 2007) for the Old Roosevelt Field Contaminated Groundwater Area site (the Site), located in Garden City, Nassau County, New York. This report was prepared for EPA, under the Response Action Contract (RAC) No. EP-W-09-002, Work Assignment No. 008-RDRD-02PE.

The selected groundwater remedy in the ROD consists of extraction of contaminated groundwater followed by ex-situ treatment and discharge of treated water to a nearby recharge basin, institutional controls, long-term monitoring, and five year reviews. The remedial design (RD) focuses on the groundwater extraction, treatment, and discharge components of the ROD.

The RD uses a performance-based approach where clear, specific, and measurable remedial action objectives have been developed to meet the ROD requirements. In lieu of specific treatment methodologies, CDM's design will serve as a baseline for the Remedial Action (RA) Contractor. The RA Contractor will have the flexibility to select different treatment methods and equipment to accomplish the ROD objectives. There are a limited number of design elements, such as performance monitoring requirements, for which prescriptive design have been provided. CDM has prepared contract drawings and specifications to be used by EPA to procure services of an RA Contractor.

1.2 Report Organization

This DAR presents the representative treatment processes, calculations, tables, figures, and reports in support of the design, and applicable permit requirements. This report has been structured as follows:

- **Section 1: Introduction** - Presents the Site history and identifies the purpose and scope of this DAR.

- **Section 2: Basis of Remedial Design** - Provides the basis of the RD. This section includes the project-level assumptions and restrictions, which serve as the boundary conditions for the proposed design.

- **Section 3: Description of Groundwater Extraction and Treatment System** - Provides a technical description of the groundwater extraction wells and the groundwater treatment system.

- **Section 4: Description of Process Controls** - Provides a technical description of the process controls for the groundwater treatment facility (GWTF). The description includes a tabulated summary of the process control logic and system responses according to standard fault conditions.

- **Section 5**: Initial Testing Program - Provides a summary of the initial testing program (ITP) elements that are applicable to groundwater treatment system start-up.
- **Section 6**: Long-Term Operation and Maintenance Program - Provides a summary of the environmental monitoring, permit compliance monitoring, and maintenance elements that are required or applicable to the groundwater treatment system's long-term operations.
- **Section 7**: Required Permit Equivalencies and Approvals - Provides a summary of the required permits that have been identified for the remedial activities.
- **Section 8**: Remedial Design Specifications - Provides a list of specifications that are required for this design.
- **Section 9**: Contract Drawings - Provides a list of the contract drawings for this design.
- **Section 10**: References - Documents the references cited in this report.

1.3 Site Background

1.3.1 General Site Location and Description

The Site is an area of groundwater contamination within the Village of Garden City, in central Nassau County, New York. The Site is located on the eastern side of Clinton Road, south of the intersection with Old Country Road (Figure 1-1). It includes a thin strip of open space along Clinton Road (known as Hazelhurst Park), a large retail shopping mall with a number of restaurants, and a movie theater. Several office buildings (including Garden City Plaza) share parking space with the shopping mall. The Village of Garden City supply wells, GWP-10 and GWP-11, are located in the vicinity. Two recharge basins are directly east and south of the mall area. The eastern basin, Pembrook, is on property owned by the mall. The basin to the south is Nassau County Storm Water Basin number 124.

1.3.2 Site History

The Site was used for aviation activities from 1911 to 1951. The United States (U.S.) military began using the Hempstead Plains field prior to World War I to train Army and Navy officers and as a training center for military pilots. In 1918, the Army changed the name of the airfield to Roosevelt Field.

After World War I, the U.S. Air Service authorized aviation related companies to operate from Roosevelt Field, but maintained control until July 1, 1920, at which time the Government sold its buildings and relinquished control of the field for commercial aviation uses.

During World War II, Roosevelt Field was again used by both the Army and Navy. The Army used the field to provide airplane and engine mechanics training to Army personnel. As of March 1942, there were 6 steel/concrete hangars, 14 wooden hangars, and several other buildings at Roosevelt Field, which were used to receive, refuel, crate, and ship Army aircraft.

In November 1942, the Navy Bureau of Aeronautics established a modification center at Roosevelt Field to install British equipment into U.S. aircraft for the British Royal Navy. The Navy was responsible for aircraft repair and maintenance, equipment installation, preparation and flight delivery of lend lease aircraft, and metal work required for the installation of British modifications. The facility also performed salvage work of crashed Royal Navy planes. The Navy vacated all but six hangars shortly after the war ended. In August 1946, Roosevelt Field again operated as a commercial airport until it closed in May 1951.

It is likely that chlorinated solvents were used at Roosevelt Field during and after World War II. Chlorinated solvents such as tetrachloroethene (PCE) and trichloroethene (TCE) have been widely used for aircraft manufacturing, maintenance, and repair operations since about the 1930s. Beginning in the late 1930s, the U.S. military issued protocols for use of solvents such as TCE for cleaning airplane parts and for de-icing. The types of airplanes designated for solvent use were present at Roosevelt Field during World War II. The finish specifications for at least one type of plane that the Navy modified at Roosevelt (eight of which were on Site in April 1943) called for aluminum alloy to be cleaned with TCE. An aircraft engine overhaul manual issued in January 1945 specified TCE as a degreasing agent.

Soon after the airfield closed, construction began at Roosevelt Field and further development was planned. The large Roosevelt Field Shopping Center was constructed at the Site and opened in 1957. Three of the old Navy hangars remained standing until sometime after June 1971, with various occupants, including a moving/storage firm, discotheque, amusement center, and bus garage.

The Village of Garden City installed supply wells GWP-10 and GWP-11 in 1952, at what had been the southwest corner of the airfield. These two wells were put into service in 1953. Over the subsequent years, several other supply wells and cooling water wells were installed and operated at the former Roosevelt Field. In the late 1970s and early 1980s, investigations conducted by Nassau County found contaminants TCE and PCE in supply wells GWP-10 and GWP-11. High levels of contamination also were found in cooling water wells at the Site. The Site was listed on the National Priority List (NPL) on May 11, 2000.

From June 2005 to December 2006, CDM, under EPA's RAC, performed a comprehensive remedial investigation (RI) at the Site (CDM 2007a) to investigate the extent of groundwater contamination and to characterize the Site geology and hydrogeology settings. During the RI, a total of 8 multiport monitoring wells were installed and two rounds of groundwater samples were collected. Monitoring well locations are shown in Figure 1-2.

Following the RI, a feasibility study (FS) was completed to evaluate the remedial alternatives to treat the contaminant plume (CDM 2007b). Based on the findings in the RI and the recommendations in the Final FS, a ROD was signed in September 2007, selecting groundwater extraction and ex-situ treatment technologies to address the Site groundwater contamination.

1.3.3 Physical Characteristics of the Area

The Site is located within the Atlantic Coastal Plain of New York. The topography of the central portion of Nassau County is characterized by a gently southward sloping glacial outwash plain.

The Site is flat to gently undulating with slopes from approximately 100 feet above mean sea level (msl) at the northern edge (along Old Country Road) down to approximately 70 feet above msl about 4,000 feet south-southwest of Roosevelt Field, along Clinton Road.

In the vicinity of the Site, the sedimentary units thicken from approximately 800 feet at the northern edge of the Town of Hempstead to approximately 1,500 feet thick beneath the barrier islands. The Upper Glacial deposits and the Magothy Formation are the geologic units of interest for the Site. The Magothy Formation consists of fine to medium quartz sand, interbedded clayey sand with silt, clay, and gravel interbeds or lenses. Interbedded clay is more common toward the top of the formation. The Upper Glacial deposits are composed mainly of stratified beds of fine to coarse grained sand and gravel; thin beds of silt and clay are interbedded with coarse grained material

The Upper Glacial and Magothy aquifer is unconfined and forms a single aquifer unit, although with different properties. In the vicinity of the Site, the depth to water ranges from 16 to 36 feet below ground surface (bgs). The saturated thickness of the Upper Glacial aquifer ranges from 20 to 40 feet, while the thickness of the Magothy aquifer is approximately 500 feet. They are the most productive and heavily utilized groundwater resource on Long Island. Average transmissivities are 240,000 gallon per day per foot (gpd/ft) for the Magothy aquifer, and 200,000 gpd/ft in the Upper Glacial Aquifer. Average hydraulic conductivities are 228 feet per day (ft/d) in the Upper Glacial, and 56 ft/d in the Magothy aquifer (Krulikas 1987b).

During the RI, the depth to the water table at the Site was measured to range between 27 and 37.6 feet bgs. The apparent horizontal groundwater flow is to the south. Based on the RI Round 1 data for the shallow aquifer, the groundwater flow gradient is 0.00156 foot (ft)/ft. Given this flow gradient, an effective porosity of 0.15 (15%), and the conductivity for the Magothy aquifer (approximately 56 ft/d), the flow rate is estimated to be 0.6 ft/d.

Water level elevation data collected from the multiport wells installed during the RI indicated that the vertical groundwater flow in these wells was downward. The four multi-port wells in the mall area have similar vertical gradients, with the differences between water levels in the shallow and deep ports within each well ranging from 1.8 to 2.9 feet. Further to the south, the vertical gradients become greater.

No naturally occurring surface water bodies are present in the vicinity of the Site. The entire Site area is essentially paved or occupied by buildings. Any runoff is routed into storm water collection systems and is generally discharged directly to either dry wells or recharge/retention basins. There are three man-made water table recharge basins located at or in the vicinity of the Site, including the privately-owned Pembrook recharge basin and two Nassau County recharge basins. Currently the Pembrook recharge basin appears to receive surface water runoff from the Garden City Plaza area during storm events, while the two Nassau County basins receive storm runoff from the municipal storm water collection system.

1.3.4 Remedial Investigation

A number of Site-related contaminants were identified during the RI, including PCE, TCE, cis-1,2-dichloroethene (cis-1,2-DCE), 1,1-dichloroethene (1,1-DCE), and carbon tetrachloride.

However, cis-1,2-DCE, 1,1-DCE, and carbon tetrachloride were only detected at low levels. The groundwater screening criteria utilized during the RI were developed based on EPA's National Primary Drinking Water Maximum Contaminant Levels (MCLs), New York State Standards and Guidance Values for Class GA groundwater (Human Water Source), and New York State Department of Health (NYSDOH) drinking water standards. The selected screening criteria for the above-mentioned Site-related contaminants were all 5 micrograms per liter (µg/L).

As no Site-related contaminants were detected in the Upper Glacial aquifer exceeding the groundwater screening criteria, the discussion below refers to the contamination in the Magothy aquifer only.

Volatile organic compounds (VOCs) were detected in the upgradient monitoring well SVP-1, but at concentrations lower than the screening criteria. At the Site, SVP-2 is the most upgradient (north) monitoring well installed and sampled during the RI. This well is located in the vicinity of the cooling water well N-8050, where the highest detected PCE and TCE concentrations occurred in 1984 during the United States Geological Survey (USGS) investigation. During the RI, TCE was detected in SVP-2 at concentrations exceeding the groundwater screening criteria (TCE concentrations ranged from 12 to 38 J µg/L). On the other hand, all detected PCE concentrations for SVP-2 were below the groundwater screening criteria.

The highest levels of PCE and TCE (350 and 280 µg/L, respectively) were detected in SVP-4, at elevations ranging from approximately -221 to -156 feet msl (approximately 250 to 310 feet bgs). It should be noted that the SVP-4 location was selected for monitoring due to the presence of a distilling well/drain field which was operated during the 1980s to dispose of cooling water contaminated with the Site-related VOCs. The next highest levels of PCE and TCE occur downgradient (to the south) of SVP-4 in monitoring well GWX-10019, at a slightly shallower depth (223 to 228 feet bgs), and in the two Village of Garden City supply wells GWP-10 and GWP-11, at depths approximately 150 feet deeper than the highest contaminant zone in SVP-4. These four wells comprise the core of the PCE/TCE contaminant plume.

Among Site-related contaminants, only TCE was detected slightly above the groundwater screening criteria in SVP-3 and SVP-5. SVP-3 and SVP-5 were considered to be the eastern edge of the contaminant plume. The highest TCE concentrations detected in SVP-3 and SVP-5 were 14 µg/L and 32 µg/L, respectively. As sources of potential groundwater contamination have been previously identified within short distances both upgradient (e.g., Johnson & Hoffman Manufacturing Corp) and downgradient of the Site (e.g., Pasley, Win-Holt Equipment Corp, Purex, Oswego Oil), the western boundary of Site-related contamination is likely Clinton Road and the southern boundary of Site-related contamination is likely near Stewart Avenue.

At the Site, the vertical extent of the contaminant plume is from 55 feet bgs to more than 455 feet bgs at SVP-2, and from 105 feet bgs to more than 425 feet bgs at SVP-4. GWP-10 is screened from 377 to 417 feet bgs; GWP-11 is screened from 370 to 410 feet bgs. Therefore, the contaminant plume in the vicinity of these two wells is likely as deep as 420 feet bgs. The large vertical extent of the plume likely results from the historical pumping of cooling water wells and supply wells at the Site.

Non-aqueous phase liquids (NAPLs) are not believed to exist at the Site and the contaminant concentrations in groundwater have significantly decreased from the 1984 levels, especially at SVP-2.

1.3.5 Pre-Design Investigation

A pre-design investigation was conducted at the Site from May to October 2008. Activities performed during the pre-design investigation included:

- Continuous water level measurements at GWX-10019 and GWX-10020
- Installation of three multiport monitoring wells: SVP-9, SVP-10, and SVP-11
- One round of groundwater sampling in October 2008
- Geotechnical testing at Nassau County Recharge Basin #124

The findings of the pre-design investigation are summarized as follows:

- Water levels in GWX-10019 and GWX-10020 decreased approximately 7 feet and 1.5 feet, respectively, from May to mid June, indicating the impact of increased pumping at the two Garden City supply wells.
- The northern boundary of the contaminant plume with TCE or PCE concentration greater than 100 µg/L extends to the north of SVP-9; the southern boundary extends to the south of SVP-11.
- The detection of TCE in SVP-11 indicates that the contaminated groundwater from the Site has migrated south of Garden City supply wells; and the TCE contaminant plume greater than 100 µg/L has migrated as deep as 482 feet bgs. The bottom of the contaminant plume is still undefined.
- Geotechnical testing results concluded that Nassau County Recharge Basin #124 has adequate capacity to accept the 200-250 gpm discharge from the proposed groundwater treatment plant.

Due to the discovery of elevated TCE concentration in SVP-11, two additional multiport monitoring wells were installed south of SVP-11 in July 2009. Groundwater sample results from these two new wells are not available at the time of this report.

1.4 Design Scope

This remedial design focus on capturing and treating the contaminated groundwater north of Garden City supply wells with the two supply wells operating under normal conditions. The contaminant plume south of the supply wells will be treated separately.

2

Section Two

Section 2
Summary of Remedial Design

This section provides a summary of the RD presented on the Contract Documents, including the major assumptions and rationale that were used to develop the key construction components of the project. This RD focuses on the components of the groundwater remedy in the 2007 ROD.

The remediation will consist of targeting and capturing the 100 µg/L plume while maintaining minimal head impact to the Garden City supply wells GWP-10 and GWP-11. The major design components include the following:

- Groundwater Modeling
- Groundwater Extraction Well Installation and Testing
- Influent Concentration Analysis
- Effluent Discharge Criteria
- Ex-Situ Treatment
- Operation and Maintenance (O&M) Sampling, Monitoring and Reporting Requirements

2.1 Description of the Performance-Based Design

The groundwater extraction and treatment system is developed using a performance-based approach. The **minimum** groundwater extraction and treatment requirements are based on the available data at the time of this design. The RA Contractor will be responsible for developing and executing detailed designs.

Performance-based design criteria and requirements were developed based on industry standards and technical considerations that are specific to the Site groundwater treatment system construction, start-up, and O&M. Examples of performance-based design criteria include the following:

- Extraction well performance requirements
- Groundwater treatment system effluent criteria
- Minimum treatment train requirements
- Minimum unit process design and sizing requirements
- Minimum process instrumentation and control requirements
- Minimum construction and/or operation standards for equipment and materials

- Minimum building/enclosure construction requirements
- Startup testing requirements to demonstrate treatment system performance based upon field data and measurements
- Minimum O&M sampling, monitoring and reporting requirements

Design considerations for the groundwater extraction and treatment system are described in the remaining sections of this report and on the Contract Drawings. The baseline designs provide the basis for RA construction cost estimates and the minimum standards for the RA Contractor proposal. The RA Contractor will submit a proposal that conforms to the objectives and requirements described in the performance-based contract documents.

2.2 Technical Approach and Design Assumptions

This section presents the development and minimum technical requirements for the design of groundwater extraction and treatment system, and the screening of treatment technology and process options considered during this design. Section 3 describes in detail the representative treatment process selected for this design. Section 4 presents the description of process controls.

2.2.1 Groundwater Modeling

A numerical groundwater model has been developed to simulate the capture zone of groundwater extraction wells and to provide the required influent flow rate for the treatment system. The contaminant plume used in the model was developed using data in the RI report. Details of the groundwater modeling effort are presented in Appendix A. The goal of the groundwater extraction wells is to capture the 100 µg/L contaminant plume with minimum impact to the operation of Garden City supply wells. In addition, the locations of these extraction wells need to be selected such that the future use of the Nassau County property Section 44, Block 077, Lot 6A will not be affected.

The final locations of the groundwater extraction wells were determined by the groundwater model; they are located at the southern edge of a parking lot approximately 600 feet north of the Garden City wells as shown on the Contract Drawing. Initially, the groundwater model results indicated that at the selected well location, groundwater extraction from -125 to -325 feet mean sea level (msl) with a total pumping rate of 200 gallons per minute (gpm) will capture the entire 100 µg/L contaminant plume. However, using a single groundwater extraction well with 200 feet of screen is not considered an effective extraction well configuration because it will be practically impossible to withdraw groundwater evenly over such a long screen by a single pump intake point. To account for subsurface heterogeneity and to minimize the potential of creating preferential flow pathways in the vicinity of the pump intake, the screen interval was limited to 60 feet. Therefore, three new extraction wells, EW-1S, EW-1I, and EW-1D, screened from -125 to -185 feet msl, -195 to -255 feet msl, and -265 to -325 feet -msl, respectively, were selected and groundwater simulations with pumping rates at EW-1S, EW-1I, and EW-1D of 60, 60, and 80 gpm, respectively, were used to evaluate the capture zone and contaminant transport. The extraction well configuration and pumping rates from the groundwater model indicated that most of the contaminant mass in the aquifer north of the extraction wells from an elevation of -50 to -350 feet below msl will be captured.

Impact to water levels at the Garden City wells due to pumping from the three new extraction wells was modeled using long-term steady-state conditions. Pumping at these new groundwater extraction wells resulted in a maximum simulated drawdown of 0.3 ft at GWP-10 and 0.2 ft at GWP-11 (Appendix A). Drawdown at this level will not impact the operation at Garden City supply wells.

2.2.2 Groundwater Extraction Well Installation, Testing and Capture Zone Analysis

As discussed in Section 2.2.1, based on the groundwater model, three groundwater extraction wells, EW-1S, EW-1I, and EW-1D, will be installed as a cluster to achieve the capture of contaminant plume at the Site. Due to the significant depth of the extraction wells, reverse circulation drilling method is recommended and the extraction wells are designed to be 10 feet apart, as indicated on the Contract Drawing.

To design the sand pack and well screen slot size and to confirm the location of screen intervals for the groundwater extraction wells, the RA contractor will obtain samples for grain size analysis from a test borehole drilled in the vicinity of the proposed extraction well locations. Samples for lithologic description will be collected every five feet from ground surface to five feet above the top of the shallowest proposed screen interval. Lithologic samples will then be collected continuously from five feet above the top of the shallowest proposed screened interval (EW-1S) to the bottom of the deepest proposed screen interval (EW-1D). A total of 18 samples, one from each 10 foot interval of the screened zone, will be collected for grain size analysis. To ensure proper sand pack and screen design, the finest grained material in the 10 foot interval will be selected for grain size analysis. The RA Contractor will submit the geologic logs, grain size analysis, and calculations for selection of appropriate filter pack material and screen slot size for review and approval.

Each extraction well will be constructed of 8-inch diameter stainless steel well casing with continuous wire-wrapped stainless steel screen. A sand pack will be tremied into the annulus around the well screen and will extend to five feet above the top of the screen. A #00 sand seal will be installed using the tremie method on top of the sand pack. The remainder of the annulus around the well will be filled with a cement/bentonite grout. A sectional view of a typical extraction well construction detail is shown on the Contract Drawing. Extraction well installation requirements are provided in specification Section 02525 - WELL INSTALLATION AND TESTING.

The extraction wells will be developed to remove drilling fluids, solids, or other particulates that may have been introduced into the formation, or deposited on the boring walls, during drilling and installation activities. Development will be performed in accordance with specification Section 02525 - WELL INSTALLATION AND TESTING until all well development criteria have been met. If the development criteria cannot be met for some reason the RA Contractor must contact the Engineer, who will collaborate with a geologist, for direction regarding well development issues.

In order to verify the capture zone prediction by the groundwater model, three monitoring well clusters will be installed and water level data will be collected. Each monitoring well cluster will consist of two wells: one shallow well screened from approximately elevation of 150 to 160 feet below msl and one intermediate well screened from approximately 220 to 230 feet below msl. These elevations correspond to the mid-point of the screened zones of the shallow groundwater extraction well EW-1S and the intermediate groundwater extraction well EW-1I, respectively. The monitoring well locations are shown on the Contract Drawing. The well cluster locations were chosen to provide data in areas of the Site that are not covered by the existing monitoring well network. The existing monitoring wells in the vicinity of the extraction wells provide data within the projected capture zone of the groundwater extraction well cluster, but only directly upgradient of the extraction wells (thereby providing little data on capture zone width.)

The MW-01S/MW-01I monitoring well cluster will be located about 300 feet upgradient of the groundwater extraction well cluster and is intended to provide water level data within the groundwater extraction well capture zone. Since the MW-01S/MW-01I monitoring well cluster is closer to the extraction wells than the existing monitoring wells SVP-2, SVP-3, and SVP-4, drawdown will be observed earlier in the MW-01S/MW-01I well cluster than in the SVP wells, and, therefore, will provide data to verify the capture zone during the early stage of the remediation. The MW-02S/MW-02I monitoring well cluster is intended to assist in determination of the width of the capture zone created by pumping at the groundwater extraction well cluster. This cluster is projected to be beyond the groundwater extraction well cluster capture zone, but within the capture zone created by Garden City pumping wells GWP-10 and GWP-11. The MW-03S/MW-03I monitoring well cluster will provide water level control points outside the capture zones of both the groundwater extraction well cluster and Garden City pumping wells GWP-10 and GWP-11.

The six monitoring wells will be installed in the same fashion as the extraction wells. However, no test borehole and grain size analysis are required. The monitoring wells will be constructed of 4-inch diameter stainless steel casing with 4-inch continuous wire-wrapped stainless steel screen (10 feet long). Monitoring well construction detail is shown on the Contract Drawing and specified in specification Section 02525 – WELL INSTALLATION AND TESTING.

To ensure that functioning extraction wells have been installed and to determine each extraction well capacity, an 8-hour step drawdown pump test will be performed at each extraction well. Step drawdown test will be performed individually at each extraction well. The Contractor will install a temporary pump in each well for the test. Pumping will commence at a constant rate equal to 0.5 times the design flow rate (step 1) for each well and continue for two hours, followed by three additional steps at flow rates of 0.80 (Step 2), 1.0 (Step 3), and 1.33 (Step 4) times the design flow rate. Groundwater samples will be collected at the conclusion of the step drawdown test for VOCs, iron and manganese analyses. Upon satisfactory completion of step drawdown pump tests of the three extraction wells, the Contractor will conduct a 72-hour sustained yield test. One goal of the sustained yield test is to measure the drawdown in the extraction wells and nearby monitoring wells caused by simultaneous pumping in all three extraction wells. The pumping phase of the test will run for 72 hours, followed by a recovery phase of 24 hours. Water level data will be collected continuously from the extraction wells and monitoring wells MW-01S, MW-01I, GWX-10019, and GWX-10020 using programmable water level transducers. Monitoring wells SVP-03, SVP-04, and SVP-05 are multilevel Westbay wells;

therefore, the Contractor will be required to obtain one set of the necessary Westbay equipment to perform manual observations of water levels on these monitoring wells. The Westbay equipment must be operated by an individual trained by Westbay to operate this equipment. Details on the step drawdown pump test, the sustained yield test and discharge requirements are provided in specification Section 02525 - WELL INSTALLATION AND TESTING. Groundwater samples will be collected during and at the conclusion of the yield test for VOCs, iron and manganese analyses. The results obtained from the step drawdown and yield test will be used for the treatment system design upon the Engineer's approval.

After completion of well testing, the Contractor will complete the well installation with a permanent well pump and a water-tight well vault. Each groundwater extraction well will be equipped with a stainless steel, environmental duty, submersible pump and a water level transducer. The bottom of each pump will be placed 3 feet above the top of the well screen to ensure proper pump motor cooling and to prevent dewatering of the screen. On the effluent line from each pump, a motorized control valve and a flow meter will be installed to control the flow. The effluent lines from three extraction wells will be joined into a common header which will serve as the influent line to the treatment plant. A sample port will also be installed in the effluent line of each individual pump for groundwater sampling. Each monitoring well will be equipped with a water level transducer.

Each well head will be enclosed in an insulated water-tight vault. Each vault will be supported on a layer of gravel and will have a locking vault door flush with the ground surface. The vault door will be constructed to sustain heavy truck load.

2.2.3 Influent Concentrations

Treatment system influent water quality was estimated based on the RI and pre-design investigation results of the monitoring wells located within the capture zone of the proposed groundwater extraction wells. Design pumping rates of 60 gpm, 60 gpm, and 80 gpm are used for EW-1S, EW-1I, and EW-1D, respectively. The estimated influent water quality is summarized in Table 2-1. Detailed calculations and rationale are presented in Appendix B.

As previously mentioned in Section 2.2.2, after the installation of groundwater extraction wells, step drawdown and yield tests will be performed and groundwater samples will be collected and analyzed for TCL-VOCs and TAL Metals. The iron result will be used to determine if iron removal will be required.

2.2.4 Effluent Discharge Criteria

The treated groundwater will be discharged to Nassau County recharge basin #124 through a stormwater manhole as shown on the Contract Drawing. Nassau County recharge basin #124 was constructed in the 1940s, collecting stormwater from the community across Clinton Road to the west, the elementary school to the south and along Clinton Road. The tributary area is 162 acres, as indicated by the Nassau County Department of Public Works (NCDPW). Based on communication with NCDPW and observations made from site visits, Nassau County recharge basin #124 appears to be operating adequately. Any overflow from Nassau County recharge basin #124 may potentially reach Hempstead Lake, which is classified as Class C surface water for fishing.

The effluent water quality criteria were developed based on the most stringent New York State Department of Environmental Conservation (NYSDEC) groundwater standards, groundwater effluent limits, and the ambient water quality standard for Class C surface water. The effluent discharge criteria are presented in Table 2-1 and Appendix B.

EPA will apply for a NYSDEC State Pollution Discharge Elimination System (NYSPDES) permit equivalent for remediation discharges to surface water or groundwater. The Contractor will be required to comply with the permit equivalent requirements.

2.2.5 Design Flow Rate

The design flow rate for the ex-situ treatment system is 200 gpm. However, the seasonal fluctuation of pumping rates at the two Garden City Wells may impact the contaminant distribution and thus impact the pumping rates of the extraction wells. To account for the seasonal fluctuation, the treatment system will be designed to accommodate a pumping rate between 150 gpm to 250 gpm.

2.2.6 Ex-situ Treatment

The minimum required groundwater treatment processes are discussed here to meet the ROD requirements. In addition, treatment options to address potentially elevated iron concentrations are listed in Section 2.2.6.5. Detailed descriptions of all the treatment processes are provided in Section 3.

2.2.6.1 Bag Filters

To protect and minimize maintenance requirements of the air stripper, bag filters will be used prior to the air stripper.

2.2.6.2 Air Stripper

A low-profile air stripper will be used for the removal of VOCs from the extracted groundwater. Liquid phase activated carbon was also considered. However, based on the estimated influent VOC concentration, using liquid phase activated carbon will require frequent carbon change-outs, which is not considered to be cost-effective.

2.2.6.3 Off-Gas

With a maximum flow rate of 250 gpm, estimated influent concentrations (Table 2-1), and assuming a 100 percent removal rate of VOCs from the liquid stream to the vapor phase, the VOC emissions are anticipated to be less than 0.63 pounds per day. For Superfund sites, air emission has to meet the requirements specified by the Office of Solid Waste and Emergency Response (OWSER) Directive 9355.0-28, titled Control of Air Emissions from Superfund Air Strippers and Superfund Sites. This directive indicates that off-gas treatment is not necessary for total VOC emissions below 15 pounds per day. For this Site, therefore, off-gas treatment is not necessary in accordance with OWSER requirements.

Air emissions for this Site are also subject to the requirements in the NYSDEC regulation 6 NYCRR Part 212 and Policy DAR-1 <u>Guidelines for the Control of Toxic Ambient Air Contaminants, for toxic air emission.</u> If the air contaminant concentrations exceed guideline values, then off-gas treatment is required. Table 2-2 presents the annual guideline concentration (AGC) and short-term guideline concentration (SGC) for contaminants identified in the groundwater at this Site.

Based on the maximum flow rate, the estimated influent contaminant concentrations and the effluent criteria presented in Table 2-1, an air stripping model was run to obtain the air flow rate required to effectively remove VOCs for this project. The estimated flow rate is 2100 cubic feet per minute (cfm). This air flow rate is used in the Air Guide 1 model as shown in Appendix C. The input data and output results are presented in Appendix C. Based on the Air Guide 1 model results, none of the contaminant air concentrations exceeds the AGC and SGC. Therefore, off-gas treatment is not required for this project.

Once the extraction wells have been installed, tested and the actual influent contaminant concentrations have been obtained, the Contractor will be required to re-evaluate the air emission rate and determine the necessity for off-gas treatment. Recommendations for the off-gas treatment will be submitted for the Engineer's approval.

2.2.6.4 pH Adjustment

The pH measurements of the monitoring wells at the Site ranged from 4.1 to 7.5. The average influent pH of the two Garden City wells was 5. The discharge criterion for pH is between 6.5 and 8.5. Therefore, pH of the treated water needs to be raised to above 6.5 before discharge using a caustic chemical feed. The amount of sodium hydroxide needed to increase the pH to greater than 6.5 will be determined by the Contractor with a bench-scale test, using the extracted groundwater from the three extraction wells.

2.2.6.5 Iron Removal System

Metals are not contaminants of concern at this Site. However, high iron concentrations were detected in some monitoring well samples and the extracted groundwater may potentially contain iron concentration exceeding the NYSDEC groundwater standard of 300 µg/L. High iron concentration can also cause fouling in the air stripper. Therefore, iron treatment may be necessary for the protection of air stripper and/or to meet the discharge requirements.

During the pre-design investigation, iron concentration as high as 19 mg/L was detected in GWX-10019, which is located in the vicinity of extraction well EW-1S and screened at the same elevation. However, after field filtration with 0.2 micron filters, the iron concentration decreased to 0.2 mg/L, indicating that most of the iron content at this location can be removed by direct filtration. Iron concentrations of filtered samples from SVP-5 and SVP-10 varied from 0.12 to 1.1 mg/L. Therefore, direct filtration with bag filters may reduce the influent iron concentration.

Bag filters installed prior to air stripper can remove the iron content that can be filtered by 50 micron filters. For the dissolved iron content, the following iron removal technologies have been considered:

- **Greensand filtration:** Greensand filter can oxidize the dissolved ferrous iron to ferric iron and remove the precipitated ferric iron by filtration. Iron concentration in the treated water is generally below 300 µg/L. Traditional greensand filters (processed natural greensand coated with manganese oxides) can treat iron concentrations up to 5 mg/L. Synthetic greensand zeolite can treat iron concentrations between 10 to 15 mg/L. Higher iron concentration will result in frequent backwash and clog the filter. For this Site, the estimated influent iron concentration is 3.6 mg/L, which is within the treatment range of this technology.

Precipitation: A typical iron precipitation system consists of chemical addition systems, a coagulation/flocculation tank, a clarifier (e.g., inclined plate clarifier), a filtration system (e.g., bag filters), and a sludge handling system. Soluble iron is oxidized prior to coagulation/flocculation, and precipitated in a clarifier. A bag filter is usually used after the clarifier to remove any suspended solids. Due to the multiple processes involved, this technology usually requires a larger building footprint compared to the greensand filtration. It also requires experienced operator to adjust chemical doses. This process is typically cost-effective for iron concentrations greater than 15 mg/L. Since the iron concentration is not expected to be greater than 15 mg/L, this process was not further considered in this design.

Due to the uncertainty of the influent iron concentration at the Site, iron removal is considered an optional process in this design.

2.2.6.6 Alternative to Iron Removal

Instead of removing the iron from groundwater, a sequestering agent can be added to the extracted groundwater to prevent iron from precipitating and clogging the pipes and equipment. Using a sequestering agent, the extracted groundwater might be discharged directly after passing through the bag filter and air stripper; or if iron removal is required by a NYSPDES permit, the iron removal can be conducted after air stripper. The iron sludge produced by this process will not contain VOC contaminants and might be cheaper for disposal. Sequestering agent usually contains phosphate or other chelate agent. Once a sequestering agent is selected, it will be tested with the extracted groundwater to ensure that the effluent can meet the NYSPDES permit requirements. Using sequestering agent is subject to approval from Federal, State and NCDPW. The RA Contractor will further evaluate this option prior to the final selection of an iron treatment system.

2.2.6.7 Summary of the Representative Treatment Process

A representative treatment train including a baseline treatment system and optional components for iron treatment was developed for this RD. The baseline treatment system consists of groundwater extraction wells, well vaults, well pumps, an equalization tank, bag filters, air stripper and discharge of treated groundwater to Nassau County recharge basin #124. The optional iron removal system will include a greensand filtration system and a sludge handling system. Detailed descriptions of the representative treatment processes are provided in Section 3.

2.3 Construction Sequence

The RA will be conducted in four phases to effectively coordinate between the baseline work and the optional work if required to be implemented. A brief description of major activities in each phase is presented below. The detailed construction sequence is provided in specification Section 01010 - SUMMARY OF WORK and the Contract Drawings.

Project Startup and Pre-Stage I will include obtaining all necessary permits and approvals from Federal, State, and local agencies; developing and obtaining approvals for all pre-construction plans and any necessary pre-construction preparation work.

Stage I - Installation of Extraction and Monitoring Wells will include installing three groundwater extraction wells and six groundwater monitoring wells, performing step drawdown and yield testing, and conducting extraction well sampling and analysis, and collecting baseline groundwater monitoring data. If iron concentration in the extracted groundwater indicates that iron treatment is necessary, a pilot test will be conducted to determine the proper treatment technology and system.

Stage II - Groundwater Treatment System Fabrication/Installation and Yard Piping will include detailed design and construction of the groundwater treatment plant, pre-final and final inspections, operational demonstration of the groundwater treatment system, and all work necessary for completion of the groundwater treatment plant.

Stage III - Site Restoration and Demobilization will include an access road, seeding, fencing, asphalt pavement and removal of all temporary construction facilities.

Stage IV - Operational and Functional Period will include O&M of the treatment plant for one year and Site-wide groundwater monitoring.

2.4 Overall Strategy for Project Delivery

2.4.1 Procurement Method/Contract Strategy

The RD specifications and drawings are prepared for a performance-based contract, which will be used by EPA to obtain the services of an RA Contractor.

2.4.2 Implementation of Schedule

A representative RA construction schedule, which illustrates the general time requirements and sequence for completion of work, is included as Table 2-3. The RA Contractor will be required to develop a more detailed schedule after contract award.

3

Section Three

Section 3
Description of Treatment System

3.1 Overview

As discussed in Section 2, the treatment system is designed to include a baseline treatment system and optional treatment components. The representative baseline treatment system includes:

- Groundwater extraction wells, monitoring wells and well vaults
- Yard Piping
- Equalization tank
- Bag filter
- Air stripper
- Discharge of treated groundwater
- Chemical feed system

The optional components of the representative treatment system include:

- Greensand filtration
- Sludge handling system

Groundwater extraction wells, submersible well pumps, and the well vaults described in Section 2 are located away from the groundwater treatment building. All other treatment equipment will be installed in the treatment building as shown on the Contract Drawing. Performance based requirements for the treatment building are also presented in this section. A process and instrumentation diagram is presented on Contract Drawing Sheets 5 and 6. Detailed descriptions of the process and instrumentation controls are presented in Section 4 and on the Contract Drawing. Table 3-1 summarizes the equipment selected and associated operational requirements for the groundwater treatment system.

3.2 Equalization Tank and Transfer Pump P-1

Prior to treatment, groundwater from the extraction wells will be pumped into an equalization tank. In order to improve the operational efficiencies of the air stripper and greensand filters (if iron removal is required), the equalization tank (T-1) will have a storage capacity that is sufficient to reduce fluctuations in influent water concentrations and flow rates.

The equalization tank is sized to provide, at a minimum, a retention time of 10 minutes with a maximum flow rate of 250 gpm. If greensand filters and sludge handling systems are required, the equalization tank will need to accommodate the circulated supernatant from the sludge settling tank before the volume of water is distributed evenly over time to the greensand filters and air stripper. Approximately 2,000 gallons of supernatant will be pumped into the equalization tank during each backwash cycle. Calculations for the equalization tank sizing are presented in Appendix D.

The influent tank will be a close-top tank equipped with an eductor to keep the whole tank well mixed.

Transfer pump (P-1) will transfer water from the equalization tank to the bag filters and subsequently to the air stripper; or to the greensand filters, if iron removal is required. The design flow rate is 200 gpm. However, the selected pump will be equipped with variable frequency drive (VFD) and be able to operate between 200 gpm to 250 gpm. Pump sizing are provided in Appendix D.

3.3 Bag Filter

Groundwater will be pumped from the equalization tank to a bag filter prior to the air-stripper to protect the air stripper from fouling. A duplex bag filter system with 50-micron filter bags will be used. Each bag filter will be able to handle the maximum flow rate of 250 gpm. Under normal operating conditions, only one bag filter will be in operation with the other as standby. When the bag filter in operation is exhausted with solids and showing undesirable pressure loss, the flow will be switched to the standby bag filter manually while maintenance is performed to the first bag filter.

3.4 Air Stripper and Transfer Pump P-2

Based on the influent concentrations, the effluent criteria (Table 2-1), and the design flow rate of 200 gpm, peak flow of 250 gpm, a low-profile air stripper (Carbonair STAT 400) with five removable trays was selected. The air stripper is also equipped with a 25 horsepower (hp) blower providing an air flow rate of 2,100 cfm. The VOC off-gas will exit the top of the air stripper via an air duct and be discharged two feet above the building roofline. The treated water will accumulate in the air stripper sump and be pumped to Nassau County stormwater manhole and discharged to Nassau County recharge basin # 124 via a 48-inch storm sewer. The air stripper will be equipped with removable trays to facilitate routine O&M. Trays can be readily switched out (i.e., with a set of spare trays) for cleaning or replaced if significant scale accumulation occurs. A hoist system will be provided to facilitate the change out of the trays. In addition, the blower will be equipped with a damper to allow for manual adjustment of the air flow rate according to influent flow and treatment requirements. The low profile air stripper selected is presented in Appendix D.

Transfer pump (P-2) with VFD will be used to transfer treated groundwater from the air stripper sump to the stormwater manhole. The VFD will control the pumping rate to maintain a constant water level in the air stripper sump. The design flow rate of the pump is 200 gpm. The operation range of the pump will be between 200 gpm to 250 gpm. Pump calculations are presented in Appendix D.

3.5 Caustic Feed System

Sodium hydroxide will be used to raise groundwater pH at the treatment plant. Sodium hydroxide will be added to the influent line of the equalization tank (T-1), which will enhance precipitation of metals and their removal by bag filters. It can also be added in the effluent discharge pipe to ensure that the pH of treated water will meet the NYSPDES permit requirements. An in-line mixer will be installed to facilitate complete mixing of sodium hydroxide and influent groundwater. The caustic feed system consists of a storage tank (T-2), two metering pumps (MP-1 and MP-1A), and associated appurtenances. A schematic of the caustic feed system is shown on the Contract Drawing. The design dose of sodium hydroxide is 20 ppm. The Contractor will be required to conduct jar tests or a pilot test during treatment system startup to determine the actual sodium hydroxide dose. A 300 gallon storage tank (T-2) was selected based on one-month supply of 50 percent sodium hydroxide solution. Appendix D presents the chemical dosage calculation.

If iron removal is required, the influent groundwater pH needs to be raised to 7 to maintain the optimum treatment condition for the greensand filters. Adjusting the pH prior to the equalization tank and monitoring the pH in the equalization tank will ensure that the required pH will be achieved.

3.6 Discharge of Treated Water

The treated groundwater will be discharged to Nassau County recharge basin #124 via a stormwater manhole located along Clinton Road. As a precaution, a level transducer will be placed in the stormwater manhole, at an elevation prescribed by Nassau County. This will shut down the treatment system when the sewer has insufficient capacity for the runoff produced by an unusual storm event.

3.7 Optional - Iron Removal System

Iron concentrations will be measured during pumping test of the extraction wells. If the influent iron concentration is determined to be greater than the NYSPDES permit requirement and iron removal is necessary, the Contractor will be required to conduct a pilot study to determine the appropriate iron removal technology and to collect operational parameters for the design of an iron removal system. In this design, a greensand filtration system is used as the representative process.

If the influent iron concentration is determined to be less than the NYSPDES permit requirement, but may cause fouling in air strippers, the contractor will also be required to conduct testing to determine the appropriate sequestering agent and its dose or to evaluate if fouling can be prevented by adjusting groundwater pH.

3.7.1. Pilot Tests

The purpose of the pilot tests is to determine the iron removal technology and to obtain design parameters so that the Contractor can design and manufacture the site-specific iron removal system and meet the construction schedule. For a greensand filtration system, the pilot test will, at a minimum, be conducted to: (1) test the sodium hypochlorite dosage and ensure that iron is oxidized; (2) determine the appropriate loading rate for this application; (3) ensure that the effluent iron and manganese concentrations meet the goals of this project; (4) test the settling characteristics of the iron sludge in backwash effluent; (5) test coagulant dose that will enhance precipitation of iron sludge, and (6) estimate operational parameters, such as backwash frequency.

3.7.2 Greensand Filters

The greensand filters are sized based on operating conditions of a synthetic media, Greensand Plus. Three greensand filters (each 4.5 feet in diameter) will be operated in parallel under service conditions with an estimated flow rate of 4.3 gpm per square foot (sq. ft.), based on the design flow rate of 200 gpm. During backwash of one filter, influent groundwater will be routed through two greensand filters at an estimated flow rate of 6.3 gpm/sq. ft. Required backwash flow rate will be approximately 12 gpm/sq. ft., for a duration of approximately 10 minutes. After backwash, there will be 15 minutes for settling and 3 minutes for rinsing, before the backwashed filter is fully back in service. Both the backwash wastewater and the rinse water will be discharged to a sludge settling tank. Clean water tank (T-7) will provide clean water for backwash provided from the effluent of the air stripper. Calculations for the sizing of greensand filters and the pump are presented in Appendix D.

At maximum flow rate of 250 gpm, the service filtration rate will be 5.2 gpm/sq.ft. when three filters are in service; and 7.9 gpm/sq.ft. when two filters are in service and the third in backwash. The service filtration rates are within the recommended normal operation range of greensand filters of 5 to 8 gpm/sq. ft.

The operation cycle between service and backwash will be generally controlled by a timer. The backwash frequency of the greensand filters will be determined during a pilot study and the initial start up. In this performance-based design, it is assumed that each greensand filter will be backwashed every 24 hours with 8 hours apart between the backwashes of different filters.

The greensand filters are designed to be operated under continuous regeneration mode. Sodium hypochlorite solution will be injected into the influent to continuously regenerate the greensand media. The schematic of a sodium hypochlorite feed system is shown on the Contract Drawing. The estimated chemical feed rate is provided in Appendix D. The actual dosage of sodium hypochlorite will be determined in the laboratory by a bench-scale test using influent groundwater.

3.7.3 Sludge Handling System

Iron sludge will be generated during the backwash process of greensand filters. A sludge handling system will consist of a sludge settling tank (T-3), a sludge holding tank (T-4), a pump (P-3) to transfer supernatant from the sludge settling tank to the equalization tank, and a transfer pump (P-4) to transfer settled sludge from the bottom of the sludge settling tank to the sludge holding tank. Depending on the settling characteristics of the iron sludge in backwash water, coagulant may be necessary. For this design, ferric chloride will be used as the coagulant to enhance settling of backwash waste in the sludge settling tank. The dose of ferric chloride will be determined based on jar testing results. Ferric chloride solution will be injected into the backwash waste header for chemical mixing.

The sludge settling tank was designed to hold the backwash and rinse water for one backwash plus extra volume for temporary sludge storage. Based on the size of the greensand filter and the backwash flow rate, each backwash will generate approximately 2,000 gallons of water. A 5,500-gallon cone bottom tank has been selected as the sludge holding tank. Calculations for sizing the tanks and chemical doses are presented in Appendix D.

The sludge settling tank was designed to be operated between the settling and transfer cycle. A pilot study will be conducted to obtain Site-specific sludge settling time, and the dose of coagulant needed. For this design, it is assumed that after the completion of each greensand backwash cycle, the solution will be allowed to settle in the sludge settling tank for seven hours, after which both the supernatant and the sludge will be pumped out within one hour. The total time of one settling and transfer cycle will be consistent with the greensand backwash schedule.

The sludge holding tank was designed to hold, at a minimum, the volume of sludge generated by one week of operation. Based on the influent iron concentration of 3.6 mg/L and a 100 percent iron removal assumption, approximately 25 pounds (lbs) of dry weight iron solid may be generated per day. Assuming that after settling the proportion of iron solids within the sludge can reach one percent, a 5,500-gallon tank was thus selected, which will allow a sludge holding time of more than one week prior to disposal.

The volume of supernatant that will be pumped back to the equalization tank will be approximately 1,800 gallons. Transfer pump P-3 with a design flow rate of 50 gpm was selected to transfer this volume within the one hour transfer cycle. Pump calculations are presented in Appendix D.

During each 1-hour transfer cycle of the sludge settling tank operation, an estimated volume of 320 gallons of sludge will be transferred from the sludge settling tank to the sludge holding tank. A progressive cavity pump that can transfer the aforementioned volume of thick sludge within half hour is selected from the pump catalog and confirmed with a pump vendor. The transfer pump selected is listed in Table 3-1 and Appendix D.

3.7.4 Clean Water Tank and Transfer Pump P-5

A 3,000 gallon clean water tank was selected to store treated water for backwash. The required volume for backwash is approximately 2,000 gallons. The calculation for sizing the tank is provided in Appendix D.

Transfer pump P-5 was selected to provide backwash flow. The design flow rate of P-5 is 190 gpm based on a backwash rate of 12 gpm/sq.ft. for one greensand filter. Calculations are included in Appendix D.

3.8 Groundwater Treatment Facility Building

The treatment building housing the groundwater treatment system will be designed to provide architectural aesthetic of the residential surroundings. The design will incorporate natural light with windows and skylights, as much as possible. The contractor will contact the Planning and Zoning Department of the Village of Garden City for specific local requirements and to obtain a building permit. The treatment building will be constructed on a reinforced concrete slab and foundation. The contractor will conduct a geotechnical investigation for the building foundation and building design.

The treatment plant will be located at the southern notch of Nassau County property Lot 6A in proximity to the water reservoir of the Garden City pumping field as shown on the Contract Drawing. The width of the treatment plant will be 40 feet or less. It can extend 70 feet into Nassau County property Lot 6A, and 40 feet on the Garden City property. The maximum size of the treatment plant is limited to 40 feet by 110 feet. The final size of the treatment building will be determined once the requirement for iron removal is established. The building will accommodate all the treatment equipment, a control room, a chemical storage room, and a unisex bathroom. It is estimated that a 35 feet by 40 feet building can accommodate the baseline treatment system should iron removal not be required. However, if a greensand filtration system and sludge handling system are required, and the greensand filtration system as described in previous section is used, the building size will be approximately 40 feet by 70 feet.

The treatment building interior will be accessible via a 36-inch wide pedestrian door and a 12-foot wide retractable door. The separate, fully-enclosed control room will house electrical and process control equipment, office space with a meeting table and chairs, a desk, cabinets and a laboratory area with bench space and sink. The chemical handling tank(s), metering pump(s) and appurtenances will be housed in a separate contained area or a fully enclosed chemical room that will be temperature controlled and vented. Heating and ventilation systems will be included to prevent the process equipment and piping from freezing during winter time (e.g., during shut-down for maintenance). Air conditioning will be included in the process control room to prevent moisture damage to the electrical/control equipment. Interior lighting, electrical outlets, and hose connections will also be included to facilitate routine maintenance activities. A hoist system will also be provided to facilitate maintenance on the air stripper.

The concrete floor slab will include a curb along its perimeter and be sloped to a trench and a sump for spill containment. The curb capacity will be at least 1.1 times the volume of the largest tank. An automatic sump pump will be equipped to pump the accumulated solution into the equalization tank. Pump calculations and selection are presented in Appendix D and listed in Table 3-1. The chemical storage tanks in the chemical room will have individual secondary containment for each chemical to be used.

The building will be secured by the existing 6-foot high chain-link fence with locking gates. The distance between the building and the fence will be approximately 15 feet.

The treatment building will be equipped with health and safety (H&S) provisions such as emergency shower and eyewash, room vapor monitor (RVM), emergency ventilation system, and fire protection system. The building will be designed in accordance with Occupational Safety and Health Administration (OSHA) requirements. A security company will be employed by the Contractor to address all fire and intrusion alarms. A security camera will be installed at the exterior of the building to monitor traffic into the facility.

3.9 Yard Piping and Trenching

The individual discharge lines of the three groundwater extraction wells will be combined with a common header in a well vault. As shown on the Contract Drawing, a 6-inch high-density polyethylene (HDPE) line will be used to convey the extracted groundwater from the well vault to the treatment facility, while a 4-inch HDPE line will be used to discharge effluent from the treatment facility to the Nassau County stormwater manhole. HDPE piping was selected due to its corrosive chemical-resistant and flexible/fatigue-resistant nature. Pipe sizing was determined based on the design flow rate of 200-250 gpm, and a flow velocity higher than two feet per second (ft/sec) to prevent sedimentation. Calculations for the influent and effluent line are shown in Appendix B.

The Contractor will field verify all utilities prior to trenching activities. The Contractor will saw cut pavement for installation of piping, as necessary. All groundwater piping, electrical/control conduits will be buried in the same trench as shown on the Contract Drawing.

Upon completion of the work, all trenching areas will be restored to pre-existing conditions as shown on the Contract Drawing.

4

Section Four

Section 4
Description of Process Controls

4.1 Overview

The GWTF will be equipped with a programmable logic controller (PLC), electronic instrumentation and controls, and mechanical equipment to: 1) allow for automated process operation and control, 2) protect process equipment from damage, and 3) prevent unforeseen hazardous and undesirable conditions associated with groundwater treatment system operations. The process instrumentation and control logic for the GWTF is summarized below and tabulated in Table 13300 -2. The process flow and instrumentation diagram for the GWTF is included on Contract Drawings, Sheets-5 and 6.

4.2 Control Panel, PLC, and Auto Dialer

4.2.1 Description of Controls

The GWTF will be equipped with a main control panel, which will contain the following:

- Operator Interface Terminal (OIT)
- PLC that records data/information from process instrumentation (e.g., instantaneous rate and totalized flow) and equipment, monitors the operational status of process equipment (e.g., on/off), performs limited changes in process operations (e.g., pumps on/off, system shutdown), and initiates communications (internal/external) to convey operational status information within the programmed constraints
- Auto-dialer that executes PLC-initiated communications (internal/external) via annunciator and phone
- Dial-in (i.e., via internet) capabilities to allow for remote operational status inquiries and programming changes
- Uninterruptible Power Supply (UPS) to provide power to the control panel during a power outage

PLC-initiated external communications will be executed by the auto-dialer according to how the PLC has been programmed. The PLC will be programmed either on site using a lap top computer, or from a remote location via a broadband connection. For telephone communications, multiple contacts and phone numbers will be included in the programming. The auto-dialer will initiate communications by starting with the first contact, which will be the plant operator. If the auto-dialer does not reach the primary contact, it will continue by initiating communication with lower-tier contacts in the programmed order, until a contact has been reached and the alarm has been acknowledged. For treatment building fire and intrusion alarms, a security company will be notified in addition to the plant operator and/or lower-tier contacts.

Once the fault conditions have been cleared, the PLC will restart the system automatically through a programmed restart sequence.

4.2.2 Fault Conditions and System Responses

Global fault conditions of the groundwater treatment system are described below:

- General:

  All fault conditions described in this section will notify the system operator through an audible/visual alarm at the OIT in the GWTF and initiate external communication through the auto-dialer.

- Power failure:

  In the event of a power failure, the entire treatment system will shut down. The PLC will, in turn, initiate external communication of this fault condition and continue to monitor the status of the system, based on backup power supplied by a UPS. After the power has been restored, if no fault conditions exist, the PLC will restart the system automatically through a programmed restart sequence.

  A power failure detection signal will be sent directly to the auto-dialer in addition to PLC.

- PLC Processor Fault:

  The PLC inputs/outputs will be configured in a fail-safe manner such that, upon a PLC fault, the entire treatment system will shut down and external communication of the fault condition will be initiated.

- Emergency Stop:

  An emergency stop station (manual button) will be included in the process room to manually shut down the system on emergency conditions.

4.3 Groundwater Extraction System

4.3.1 Description of Controls

The three groundwater extraction wells (EW-1S, EW-1I, and EW-1D) will be operated simultaneously. The effluent line of each pump will be equipped with a flow indicating transmitter and a motorized globe valve to control the flow rate. The flow rate from each extraction well will be displayed on the OIT. The three effluent lines will be combined into one influent header that discharges to the equalization tank at the treatment plant as shown on the Contract Drawings.

Each extraction well will be equipped with a level transducer to prevent the pump from running dry. Pump protection features are hardwired to shut down the pump upon a fault condition in both manual and automatic mode. Additional controls are as follows:

- The extraction well pumps can be operated manually under Hand Mode or automatically by PLC under Auto Mode.

- The operational status of well pumps will be displayed on the OIT.

- Each extraction well pump will have a pump status box for pump protection under the following conditions: over-voltage, under-voltage, dry run, speed reduction, over-temperature, and over-load.

- The influent header will be equipped with a pressure switch in the well vault.

4.3.2 Fault Conditions and System Responses

- Well pump failure:

  For each pump, the following fault conditions will be transmitted to the PLC from the pump status box and will be hardwired to shut off the pump: over-voltage, under-voltage, dry run, speed reduction, over-temperature, and over-load. The PLC in turn will not try to restart the pump until the fault condition is reset.

- High pressure in influent header:

  The high pressure switch will signal the PLC and send an alarm. The PLC will shut down the well pumps and will initiate the auto-dialer.

- Low water level in extraction well:

  At the detection of an unacceptably low water level, the PLC will shut down the extraction well pump in that well to prevent the pump from running dry, send an alarm, and will initiate the auto-dialer.

The well pumps will also be shut down due to the following fault conditions described in other sections:

- High high level in equalization tank

- High level in the air stripper sump

- Low pressure on the discharge line of air stripper blower B-1

- High water level in the stormwater manhole where treated groundwater is discharged

- High high level in building sump, with time delay to avoid false trips.

4.4 Equalization Tank (T-1) and Transfer Pump (P-1)

4.4.1 Description of Controls without Iron Removal System

The equalization tank (T-1) is used to equalize the groundwater quality and flow fluctuation that may occur. Effluent from the equalization tank will be pumped into the duplex bag filter system with a VFD and transfer pump P-1. The equalization tank will be equipped with level switches and a level indicating transmitter to control the operation of the VFD of the transfer pump. A pH analyzer will also be installed in the equalization tank for the dosage control of the caustic feed system.

4.4.2 Fault Conditions and System Responses without Iron Removal System

- Pump failure:

  The following fault conditions will be transmitted to the PLC from the pump status box and will be hardwired to shut off the pump: over-voltage, under-voltage, dry run, speed reduction, over-temperature, and over-load. The PLC will not try to restart the pump until the fault condition is reset. An alarm will be sent to the operator and the PLC will initiate the auto-dialer.

- VFD fault condition:

  A VFD fault condition will shut down the transfer pump (P-1) and the system. An alarm will be sent to the operator and the PLC will initiate the auto-dialer.

- Discharge of untreated water when the equalization tank transfer pump (P-1) is operating in HAND mode:

  Transfer pump P-1 will be programmed so that the transfer pump P-1 cannot operate unless the air stripper blower is running at full speed.

- High high water level in equalization tank:

  The PLC will shut down the well pumps, initiate the auto-dialer and send an alarm to the operator.

- Low low water level in equalization tank:

  The PLC will shut down the transfer pump P-1, initiate the auto-dialer and send an alarm to the operator.

4.4.3 Optional - Description of Controls with Iron Removal System

If iron removal is required, the equalization tank will provide sufficient buffer capacity to hold the supernatant pumped from the sludge settling tank and allow it to be distributed evenly over time to the subsequent treatment units. Effluent from the equalization tank will be pumped into the greensand filtration units with transfer pumps P-1. The general operation and controls are the same as described in Section 4.4.1 and 4.4.2 except the control of transfer pump P-1, which is based on the water level data from the water level indicating transmitter. Additional controls are as follows:

- Level transmitter:

  The level transmitter will be used to control transfer pump P-1 to operate at variable flow rates to accommodate supernatant from the sludge settling tank.

- High water level:

  The high water level in the equalization tank indicates that the supernatant from the sludge settling tank is pumped into the equalization tank. The PLC will control the VFD of transfer pump P-1 to pump at a flow rate higher than the influent flow rate from the well pumps.

- Low water level:

  The low water level in the equalization tank indicates that the supernatant from the sludge settling tank has been redistributed into the treatment system. The PLC will control the VFD and transfer pump P-1 to operate at the same flow rate as the influent based on the feedback from the influent flow meter. (The PLC will also send a signal to the PLC controlling transfer pump P-3 that the equalization tank is ready to accept flow from the sludge settling tank.)

- Low low water level:

  The low low water level in the equalization tank will be set to provide sufficient buffering volume for transfer pump P-1 to adjust to the low influent flow rate. The low low water level switch will send an alarm to the operator. The PLC will stop transfer pump P-1 and initiate the auto-dialer and notify the operator.

4.5 Bag Filters

A duplex bag filter system with two bag filters will be used with one in operation at any given time. A differential pressure switch will be installed on the common influent and effluent lines of the duplex bag filter system. At a high differential pressure, an alarm will be sent to the OIT. The PLC will shut down the system and initiate the auto-dialer to alert the operator for bag filter change out.

4.6 Air Stripper System and Transfer Pumps (P-2)

4.6.1 Description of Controls

The air stripper system includes the air stripper and the blower B-1. A transfer pump (P-2) with VFD will be provided for the discharge of treated groundwater. The air stripper sump will be equipped with level switches and a level transmitter to control the speed of the VFD at transfer pump (P-2), and maintain a constant water level in the sump. Additional controls are described below:

- Blower B-1 will start first by the PLC; well pumps will start with time delay. Transfer pump P-2 will be turned on at the detection of a preset water level in the air stripper sump.

- A low level switch in the air stripper sump will shut down transfer pump P-2 to prevent the pump from running dry.
- The blower (B-1) will be equipped with a low pressure switch to detect fault conditions for the blower and blower discharge line.
- The transfer pump (P-2) can be operated under Hand Mode or Auto Mode.

4.6.2 Fault Conditions and System Responses

- Discharge of untreated groundwater due to blower malfunction:

  Under all blower fault conditions as described in this section, the entire system will be shut down by the PLC.

- Discharge of untreated groundwater during system startup and shutdown:

  The PLC will be programmed to include delays at transfer pump (P-2) start and stop to allow for: 1) the blower to reach full speed before the transfer pump turns on (e.g., 15-30 second delay) and 2) treatment of the groundwater in the air stripper after the transfer pump shuts down (e.g., 1-2 minute delay). The transfer pump will not be able to start if a fault condition exists for the air stripper or blower.

- High level in air stripper sump

  The high level switch in the air stripper sump allows the detection of an unacceptably high water level and will send a signal to the PLC to shut down the system, including the well pumps. A time-delay will be provided for the blower to avoid discharge of untreated water.

- Damage to the blower shaft during a quick restart:

  The PLC will be programmed to include an operator adjustable delay after shutdown (e.g., 2-5 minute delay) to allow the blower to reach a complete stop before it can be restarted.

- Low pressure on the blower discharge line:

  The PLC will automatically shut down the system when a low pressure is detected.

- VFD fault condition:

  A VFD fault condition will shut down the transfer pump P-2 and the entire system.

- Pump Failures:

  PLC will shut down the transfer pump (P-2) and the entire system. PLC will initiate the auto-dialer; and an alarm will be sent to the operator.

4.7 Effluent Discharge System

4.7.1 Description of Controls

Treatment plant effluent will be pumped by a transfer pump (P-2) to the stormwater manhole located in front of Garden City Well Field #10 and #11, and eventually discharged to recharge basin #124. The effluent line will include an electronic flow meter with flow indicating transmitter to allow for the recording of instantaneous flow and total flow by the PLC. The operator can totalize the volume of discharged water and use the data to complete monthly reports and NYSPDES discharge monitoring reports.

The stormwater manhole will be equipped with a high level switch for detection of unacceptably high water levels during unusual storm events and allow the system to shut down.

The effluent line will also be equipped with a pH analyzer to monitor the pH of discharged groundwater. Based on the pH data, the operator can adjust the caustic feed rate to meet NYSPDES permit equivalent requirements.

4.7.2 Fault Conditions and System Responses

- High water level in stormwater manhole:

If the water level in the stormwater manhole rises above the high level switch, the PLC will shut down the entire treatment system including extraction well pumps; initiate an auto-dialer and notify the operator through an alarm.

4.8 Caustic Feed System

4.8.1 Description of Controls

To correct the low groundwater pH, caustic solution from the storage tank (T-2) will be fed into the equalization tank (T-1) to enhance iron removal (and to correct the pH for proper operation of greensand filters, as necessary). The pH measurement data collected in the equalization tank will be sent to the PLC, which will set the dosage rate for the caustic chemical feed metering pump (MP-1).

In addition, pH can drop through the treatment processes (such as air stripper). Caustic solution will also be added in the plant effluent discharge line to ensure that the pH of treated water will meet NYSPDES permit requirement. A pH analyzer will be placed after the inline mixer to monitor the pH continuously. If the pH is outside the permit requirement value, the PLC will control metering pump (MP-1A) to adjust caustic solution dose.

The operation of the metering pumps (MP-1 and MP-1A) is controlled manually or by the PLC. The caustic feed metering pumps will be turned on and off by the PLC in accordance with the on and off of the well pumps. The caustic storage tank (T-2) will be equipped with a low level switch and a low low level switch.

4.8.2 Fault Conditions and System Responses

- Metering pumps (MP-1/MP-1A) Failures:

  The PLC will initiate the auto-dialer; an alarm will be sent to the operator.

- Low level in caustic storage tank (T-2)

  The PLC will initiate the auto-dialer. An alarm will be sent to the operator.

- Low low level in caustic storage tank (T-2)

  The PLC will shut down MP-1/MP-1A and the system, and initiate the auto-dialer. An alarm will be sent to the operator.

4.9 Optional - Greensand Filtration System and Sodium Hypochlorite Feed System

4.9.1 Description of Controls

Three greensand filters will be operated in parallel under service conditions. During backwash, groundwater will be treated through two greensand filters at the design flow rate. Plant effluent will be stored in a clean water tank (T-7) and used to backwash greensand filters. The backwash generally involves 10-minute backwash, 15-minute settling, followed by 3-minute rinse. Both backwash wastewater and rinse water will be discharged to the sludge settling tank. Each greensand filter will be equipped with a differential pressure switch, a flow transmitter, a timer, and electric motor actuated butterfly valves on the influent and effluent lines during service, backwash influent lines, and waste lines. Backwash can be triggered by a programmed timer, a preset high differential pressure, or a preset maximum volume of groundwater treated. Under normal operational conditions, it is preferred that the backwash cycle be controlled by a timer. The PLC will be programmed to open and close valves under service conditions or backwash conditions.

A sodium hypochlorite feed system will be used to continuously regenerate the greensand media. The sodium hypochlorite feed metering pump can be operated manually or automatically by the PLC. A chlorine analyzer will be installed in the effluent line of the greensand filtration system to monitor effluent chlorine concentrations. The chlorine concentration will be transmitted to the PLC; in turn, the PLC will control the dosing rate of sodium hypochlorite by controlling the metering pump.

4.9.2 Fault Conditions and System Responses

- Electric motor actuated butterfly valve malfunction:

  The PLC will shut down the system and initiate the auto-dialer. An alarm will be sent to the operator.

- Backwash failure:

  If backwash of greensand filters cannot be initiated due to transfer pump P-3 or P-5 failure or other reasons, The PLC will shut down the system and initiate the auto-dialer. An alarm will be sent to the operator.

- Sodium hypochlorite metering pump (MP-2) failure:

  The PLC will shut down the system. An alarm will be sent to the operator. A time delay will be provided to avoid false trips.

- Low level in sodium hypochlorite storage tank (T-5):

  The PLC will initiate the auto-dialer. An alarm will be sent to the operator.

- Low low level in sodium hypochlorite storage tank (T-5):

  The PLC will shut down MP-1 and the system, initiate the auto-dialer. An alarm will be sent to the operator.

4.10 Optional - Sludge Settling Tank (T-3), Transfer Pump (P-3), and Ferric Chloride Feeding System

4.10.1 Description of Controls

The sludge settling tank will be operated between the settling and transfer cycles. Once backwash and rinse of a greensand filter is complete and the sludge settling tank is filled with waste water, the sludge settling tank will be in settling mode. A timer will be programmed to allow the suspended solids to settle out in the sludge settling tank. At the end of the settling cycle and upon detection of a low level in the equalization tank, the PLC will start the transfer pump P-3 and pump the supernatant from the settling tank to the equalization tank. Transfer pump P-3 will be shut down by the PLC at a preset low water level in the sludge settling tank or by the timer.

Ferric chloride solution will be used as coagulant to enhance settling of iron sludge. The ferric chloride feeding system will include a storage tank (T-6), a metering pump (MP-3) and associated apparatus. Ferric chloride solution will only be added during a backwash cycle. A flow switch will be installed in the waste line of the greensand filtration system to control the operation of MP-3. MP-3 will be turned on with the detection of flow in the waste line and shut down when flow in the waste line stops.

4.10.2 Fault Conditions and System Responses

- High water level in equalization tank (T-1):

  A high water level in the equalization tank will cause the PLC to shut down transfer pump P-3. If transfer pump P-3 is stopped before the water level in the sludge settling tank has been dropped to the low level, an alarm will be sent to the operator and the PLC will initiate the auto-dialer.

- High level in sludge settling tank (T-3):

  The PLC will suspend the backwash of greensand filters. The PLC will initiate the auto-dialer. An alarm will be sent to the operator.

- Transfer pump (P-3) failure:

  The following fault conditions will be transmitted to the PLC from the pump status box and will be hardwired to shut off the pump: over-voltage, under-voltage, dry run, speed reduction, over-temperature, and over-load. The PLC will not try to restart the pump until the fault condition is reset. An alarm will be sent to the operator. The PLC will initiate an auto-dialer.

- Coagulant (ferric chloride) metering pump (MP-3) failure:

  The PLC will initiate an auto-dialer. An alarm will be sent to the operator.

- Low level in coagulant storage tank (T-6):

  The PLC will initiate the auto-dialer. An alarm will be sent to the operator.

4.11 Optional - Sludge Holding Tank (T-4) and Transfer Pump (P-4)

4.11.1 Description of Controls

At the end of the settling cycle in the sludge settling tank controlled by a timer, sludge accumulated at the bottom of the sludge settling tank will be pumped into a sludge holding tank (T-4) by a transfer pump P-4. A timer will be programmed so that the transfer pump P-4 will only be operated for a preset amount of time and then will be shut down by the PLC.

The operator will arrange to empty the sludge holding tank once a week.

The sludge holding tank will be equipped with a high level switch. Upon detection of an unacceptably high sludge volume, an alarm will be sent to the operator and the PLC will initiate the auto-dialer.

4.11.2 Fault Conditions and System Responses

If any pump failures of the transfer pump P-4 occur, an alarm will be sent to the operator and the PLC will initiate the auto-dialer.

- Transfer pump (P-4) failure:

  The following fault conditions will be transmitted to the PLC from the pump status box which will be hardwired to shut off the pump: over-voltage, under-voltage, dry run, speed reduction, over-temperature, and over-load. The PLC will not try to restart the pump until the fault condition is reset. An alarm will be sent to the operator. The PLC will initiate the auto-dialer.

4.12 Optional - Clean Water Tank (T-7) and Transfer Pump (P-5)

4.12.1 Description of Controls

To backwash the greensand filters, a clean water tank and a transfer pump P-5 are selected. Treated water from the air stripper will be stored in T-7 and used in greensand filter backwash. Two motorized valves will be installed, one on the effluent discharge line and one on the influent line to T-7 as shown on the Contract Drawings. After each backwash, the PLC will close the valve on plant effluent discharge line and open the valve on influent line to T-7 to fill up the tank (T-7). Once the water level in T-7 reaches the high level, a level switch will signal the PLC to control the open and close of the two valves and discharge treated water to the stormwater manhole. A transfer pump P-5 will be used to pump water from the clean water tank (T-7) to the greensand filter to be backwashed.

4.12.2 Fault Conditions and System Responses

- Transfer pump (P-5) failure:

  The following fault conditions will be transmitted to the PLC from the pump status box which will be hardwired to shut off the pump: over-voltage, under-voltage, dry run, speed reduction, over-temperature, and over-load. The PLC in turn will not try to restart the pump until the fault condition is reset.

  The PLC will initiate the auto-dialer. An alarm will be sent to the operator.

4.13 Treatment Facility Building

4.13.1 Building Sump

4.13.1.1 Description of Controls

The building spill containment sump (SMP-1) will be equipped with high and low level switches to start/stop the sump pump, and a high-high level switch. The high and low level controls are integral to the sump pump design and are not controlled by the PLC.

4.13.1.2 Fault Conditions and System Responses

- High-high water level in sump:

  If the water level inside the sump rises above the high-high level switch, the switch will close and send a corresponding signal to the PLC. The PLC will shut down the entire treatment system, initiate auto dialer and send an alarm to the operator.

4.13.2 Chemical Containment Area

4.13.2.1 Description of Controls

A leak detector will be equipped at the low point within the chemical storage tank and feed system containment area. Upon detection of leakage, an alarm will be sent to the operator and the PLC will initiate the auto-dialer. The operator will check the working condition of the leak detector periodically.

4.13.3 Health and Safety Provisions

4.13.3.1 Description of Controls

The building will also be equipped with several H&S provisions, which will be integrated with the PLC, including but not limited to:

- Fire protection system
- Room vapor monitor (RVM)
- Emergency ventilation system

4.13.3.2 Fault Conditions and System Responses

- High vapor concentrations as detected by the RVM:

The PLC will activate the emergency ventilation system and notify the operator.

5

Section Five

Section 5
Initial Testing

This section describes the components of a comprehensive initial testing program (ITP), which will be completed following substantial completion of the groundwater treatment system construction. The ITP consists of a 14-day operational test and a 48-hour performance test. The purpose of the ITP is to verify that the groundwater treatment system is capable of continuous operation in accordance with the performance requirements as described in Sections 3 and 4 or otherwise specified in the Contract Documents. The ITP elements are described below and the groundwater treatment system ITP sampling and monitoring schedules are included in Table 5-1.

5.1 Program Elements

5.1.1 Baseline Groundwater Sampling and Monitoring

Prior to system start-up, baseline groundwater sampling and field measurements will be collected at monitoring wells and extraction wells in accordance with the environmental monitoring program schedule for Site-wide groundwater described in Section 6.2. The purpose of this groundwater monitoring event is to establish baseline conditions prior to groundwater treatment system startup. The baseline monitoring results will be compared with ITP monitoring results to assess groundwater treatment system performance and to refine/optimize groundwater treatment system operational settings. The baseline monitoring results will also be compared to the results of future Site-wide groundwater monitoring events, as described in Section 6.2, to assess long-term groundwater treatment system performance over time.

5.1.2 Initial Start-up Testing, Sampling, and Monitoring

Following completion of the baseline groundwater sampling, hydraulic and operational testing, the ITP will be initiated. A 14-day operational test will be conducted for the groundwater treatment system, which will include start-up of the extraction wells and the treatment system. The purposes of the 14-day operational test are: 1) to demonstrate long-term operability of the system and 2) to confirm performance expectations with regard to contaminant removal. At the beginning of the 14-day test, each individual extraction well will be tested separately, and the results will be evaluated against the corresponding performance data of the treatment system. Subsequent to the individual tests, all three groundwater extraction wells will be in operation, and the performance of the entire treatment system under full operational capacity will be tested.

Upon completion of the 14-day operational test, after all identified mechanical problems have been mitigated; a 48-hour performance test will be conducted. The 48-hour performance test is intended to demonstrate performance of the system over a short duration. If no significant operational problems have been encountered during the 14-day operational test as determined by the Engineer, the 48-hour performance test will not be required.

Table 5-1 summarizes the minimum requirements for ITP sampling and field measurements to demonstrate achievement of the groundwater treatment system performance criteria and permit compliance.

6

Section Six

Section 6
Long-term Monitoring

This section describes the general requirements for performing the long-term O&M on the groundwater treatment system, environmental sampling and monitoring, and routine reporting. The RA Contractor will be responsible for the O&M during the first year. All sample collection and analyses will be conducted in accordance with specification 01450 - CHEMICAL DATA QUALITY CONTROL and the approved Uniform Federal Policy for Quality Assurance Project Plan (UFP QAPP).

6.1 Long-Term O&M

The RA Contractor will operate the groundwater treatment system on a continuous basis and perform routine, preventative, and corrective maintenance for the associated processes, equipment, controls, facilities, and appurtenances as part of the O&M during the first year. The O&M work will be conducted in accordance with the Contract Documents, equipment manufacturer's specifications and O&M instructions, and the RA Contractor's approved O&M Manual. The RA Contractor is required to maintain a minimum of 90 percent uptime of the treatment system.

6.2 Environmental Sampling and Monitoring

Environmental sampling and monitoring will be performed to assess achievement of remedial objectives and effectiveness of treatment, and to confirm compliance with effluent criteria. The groundwater monitoring schedule, and GWTF performance and compliance monitoring schedules are presented in Tables 6-1 and 6-2, respectively. The monitoring well locations are shown on Figure 2-1.

The purposes of these monitoring activities are summarized below:

- The monitoring program will require periodical collection of water level measurements at wells specified in Table 6-1 to confirm the capture zone achieved by the extraction wells. The required capture zone, as estimated by the Site groundwater modeling, is illustrated in Appendix A. Measurements will be collected more frequently until the system has reached steady-state.

- Groundwater treatment system performance monitoring provides information/data that will be used to verify whether the treatment system and individual components are operating properly. The information/data will also be used to determine whether the operational setting needs to be optimized. Operational parameters will be recorded on a routine basis by process controls and by the operator, including extraction well/influent flow rates, line pressure at all gauges, usage of chemicals (including sodium hydroxide, sodium hypochlorite and ferric chloride, as necessary), alarm conditions, and other standard and pertinent operating parameters.

- Groundwater treatment system permit compliance monitoring is required to demonstrate conformance with the NYSPDES remediation discharge effluent requirements, as presented in Table 2-1. In addition, air emission monitoring and sampling are required to demonstrate that the discharge of toxic air pollutants meet the NYSDEC air toxic program SGC and AGC requirements. The frequency of air sampling is presented in Table 6-2.

- Site-wide groundwater sampling provides information/data that will be used to evaluate remedy effectiveness and monitor remedial progress over time. The data/ information will be compared with the design assumptions. Adjustment to operations will be made as necessary.

6.3 Reporting

6.3.1 Monthly Status Reports

Monthly Operating Logs will be prepared and submitted by the RA Contractor. These logs will present a summary of all pertinent operations, maintenance, and monitoring activities completed during the reporting period, including the following:

- Extraction well flow rates and volume of groundwater treated
- Performance, compliance, and environmental monitoring activities completed, and copies of chain-of-custody forms and tabulated monitoring results
- Completion of routine and non-routine O&M activities
- Any operational problems encountered
- Any H&S activities that have occurred or issues that have been identified
- Dates and quantities of chemical deliveries
- Waste disposal quantities, copies of characterization sample results, and disposal records/manifests

6.3.2 Laboratory Data Packages

Laboratory-generated sample data packages and validation reports will be submitted upon receipt. These data will also be reviewed, summarized, and evaluated in the Remedial Progress Reports, as described below.

6.3.3 Remedial Progress Reports

Remedial Progress Reports will be prepared by the RA Contractor and submitted to the EPA and NYSDEC on a quarterly basis for one year O&M period. The reports will include a detailed summary and analysis of remedy performance, including, but not limited to:

- Tabulated summary of groundwater data and field measurements
- Tabulated summary of compliance sampling and monitoring results to demonstrate conformance with the NYSPDES permit equivalency

- Tabulated/graphed summary of groundwater treatment system performance, including average flow rates, cumulative volume of groundwater extracted, mass removal rates, and cumulative mass removed
- Groundwater elevation iso-contour maps and capture zone estimates
- Graphs for updated groundwater TCE and PCE concentration trend analyses
- Written summary, assessment, and discussion of RA progress for the reporting period
- Recommendations for future maintenance activities

7 Section Seven

Section 7
Required Permit Equivalencies and Approvals

The permit equivalencies and approvals identified as being required for remedial activities at the Site are summarized below. The required permit equivalencies/approvals, permitting authorities, and contacts are listed on Table 7-1.

7.1 Air Pollution Control Permit

In accordance with NYSDEC regulation 6 NYCRR Subpart 201-3.3, air strippers at a superfund site are considered trivial activities, and the owner and operator of such trivial activities are exempt from obtaining an NYSDEC air pollution control State Facility permit. However, a Registration certificate for source construction and operation will still be required. A copy of the Registration certificate form and associated instruction are included in Appendix E. The owner and/or operator of an exempt source will be required to certify that it is properly operated, and must maintain on-site records. Therefore, the discharge of toxic air pollutants, such as PCE and TCE, needs to meet the regulatory requirements specified in the NYSDEC Air Toxics Program.

The regulatory requirements of the air toxics control program are described in 6 NYCRR Part 212 and in DAR-1 (the Guideline for the Control of Toxic Ambient Air Contaminants). There are two levels of air cleaning requirements for an air pollution source in Nassau County (within the New York City Metropolitan Area): 1) each individual contaminant will comply with the SGC and AGC requirements based on the results of DAR-1 model; and 2) 99 percent air cleaning is required for a source emitting volatile organic compounds more than 1 lb per hr. The SGCs and AGCs for site-related contaminants are presented in Table 2-2. The input data of the DAR-1 model and the model results are presented in Appendix C.

7.2 New York State Pollution Discharge Elimination System Equivalent

An NYSPDES permit equivalent for remediation discharges is required for the discharge of the treated groundwater into the subsurface via a recharge basin. As part of the permit equivalent requirements, the effluent water is required to meet the NYS groundwater quality standards and surface water standards. The NYSPDES permit equivalent application will be submitted by EPA. A copy of the NYSPDES equivalent form is included in Appendix E.

7.3 Permit to Connect to the Nassau County Storm Drainage System

The treated groundwater will be discharged to the local Nassau County recharge basin #124. A non-stormwater discharge request has been submitted to the Nassau County Department of Public Works (NCDPW) by EPA. EPA has also held discussions and performed field visits with NCDPW with regard to the discharge of the treated water to Recharge Basin #124. EPA has received verbal concurrence from NCDPW. A formal letter of concurrence with initial and routine maintenance requirements will be provided by NCDPW at a later time.

Any overflow from Recharge Basin #124 will flow to recharge basin #540 via underground pipes, and potentially to Horse Brook, Hempstead Lake and ultimately tidal waters should an overflow occur in recharge basin #540 as well. In accordance to NYSDEC Part 885, Table 1, Hempstead Lake is classified as Class C fresh surface water, suitable for fishing.

7.4 Long Island Well Permit

Under NYSDEC Part 602, well permits will be required for the installation of the extraction and monitoring wells. The permit application will be prepared and submitted to the NYSDEC by the drilling subcontractor who will perform the activity.

7.5 Building Permits, Planning and Zoning Board Approval - Local

Building permits will cover the construction of the treatment facility and associated access ways, and the piping networks. The building permits will also cover the electrical, building, plumbing, and fire subcode permits that will be required. A building permit is valid for a period of one year from the date of issue.

Planning Board and Zoning Board approvals will be required for all siting, construction, and operation of the remedial action. The RA Contractor will be responsible for submitting the plans to the Planning Board and Zoning Board for approval prior to the start of project.

7.6 Erosion and Sediment Control Plan Approval

An Erosion and Sediment Control Plan is required by the Nassau County Soil and Water Conservation District and NYSDEC. An Erosion and Sediment Control Plan will be submitted to the agency for approval. The RA Contractor will be responsible for submitting the application and plan.

7.7 Connection to Water Main

Potable water will be required at the GWTF building, and connection to a water main will be required as a result. The RA Contractor will be responsible to coordinate with Garden City Water Authority for the service line.

7.8 Property Access Agreement and Easement

EPA has secured access agreements and easements with current property owners, for: 1) groundwater treatment systems and associated pipelines to be constructed; 2) extraction wells and new monitoring wells to be installed; 3) new water service line to be installed; and 4) existing/new wells for use as part of long-term groundwater monitoring. Copies of signed access agreements are presented in Appendix F.

Access agreements will need to be maintained with property owners for existing/new monitoring wells located on Site, in order to perform routine groundwater monitoring activities.

The RA Contractor is responsible for compliance with applicable local codes (i.e., Village of Garden City and Nassau County) when obtaining utility easements for pipelines. A piping easement, 5 feet wide and a total of approximately 2,000 feet long, is anticipated within the Garden City Plaza parking area and along Clinton road. In addition, a 20 feet wide easement is granted for influent, effluent pipelines and service lines into the treatment building as shown on the Contract Drawing.

8 Section Eight

Section 8
References

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Tables

Table 2-1
Influent Concentrations and Effluent Targets
Old Roosevelt Field Contaminated Groundwater Area Superfund Site, Garden City, New York

Parameters	Units	Influent Water Quality [1]	Effluent Targets [2]
Flow Rate:	gpm	200	NA
pH [3]	unit	5.0	6.5 - 8.5
Target VOCs:			
Dichlorodifluoromethane	µg/L	7.7	5
cis-1,2-Dichloroethene	µg/L	8.1	5
Tetrachloroethene	µg/L	53.1	1
Trichloroethene	µg/L	139.7	5
Target Metals: [4]			
Iron	mg/L	3.6	TBD

Notes:
1. Average influent water quality estimates (expected after the system has reached steady state conditions) are based on weighted averages of well concentrations within the capture zone. (Appendix B)
2. Effluent targets were determined using the lowest values between Federal Drinking Water, and New York State Ambient Water Quality Standards and Guidance Values for Class GA Groundwater and Class C Surface Water.
3. The average influent pH of two Garden City supply wells is used.
4. Iron treatment is to meet the New York State Pollution Discharge Elimination System (SPDES) permit requirements and for scaling and fouling protection of the treatment system.

ug/L - micrograms per liter | ND - non-detect | NA - not applicable
mg/L - milligrams per liter | TBD - to be determined based on SPDES permit

Table 2-2
Air Emission Targets
Old Roosevelt Field Contaminted Groundwater Area Superfund Site
Garden City, New York

Chemical Name	AGC (µg/m3)	SGC (µg/m3)	Air Emission Targets (µg/m^3)	Groundwater Flow Rate (gpm)	Groundwater Influent Concentration (µg/L)	Maximum DAR-1 Model Results (µg/m^3)
cis-1,2-Dichloroethene	63	NA	63	250	8.1	0.023
Dichlorodifluoromethane	12,000	NA	12,000	250	7.7	0.023
Tetrachloroethene	1	1,000	1	250	53.1	0.156
Trichloroethene	0.5	14,000	0.5	250	139.7	0.411

Note:
AGC: annual guideline concentration
SGC: short-term guideline concentration
NA: not available
DAR-1: New York State Department of Environmental Conservation, Air Guide 1, DAR-1 model.

Table 2-3
General Remedial Action Construction Schedule
Old Roosevelt Field Contaminated Groundwater Area Superfund Site
Garden City, New York

ID	Task Name	Duration	Start	Finish
1	Notice to Proceed	1 day	Mon 3/1/10	Mon 3/1/10
2	Pre-Construction Submittals	44 days	Tue 3/2/10	Fri 4/30/10
3	Permits	180 days	Tue 3/2/10	Mon 11/15/10
4	Staging Area Construction	10 days	Mon 5/3/10	Fri 5/14/10
5	Test Borehole	10 days	Mon 5/10/10	Fri 5/21/10
6	Extraction Wells Installation	45 days	Tue 6/1/10	Tue 8/3/10
7	Monitoring Well Installation	84 days	Wed 8/4/10	Mon 12/6/10
8	Extraction Well Testing	20 days	Fri 9/3/10	Fri 10/1/10
9	Pilot Testing	15 days	Mon 10/4/10	Mon 10/25/10
10	Geotechnical boring and testing	10 days	Mon 5/17/10	Mon 5/31/10
11	Detailed Design	66 days	Mon 8/23/10	Mon 11/29/10
12	Design Review and Approval	15 days	Wed 12/1/10	Tue 12/21/10
13	Treatment Building Construction	88 days	Fri 1/7/11	Wed 5/11/11
14	Yard Piping	44 days	Wed 12/22/10	Thu 3/3/11
15	Treatment System Installation	66 days	Tue 4/12/11	Tue 7/12/11
16	Treatment System Shakedown	10 days	Wed 7/13/11	Tue 7/26/11
17	Baseline Groundwater Sampling	10 days	Wed 7/6/11	Tue 7/19/11
18	Pre-Final Inspection	1 day	Fri 7/29/11	Fri 7/29/11
19	System Initial Startup Testing	16 days	Mon 8/1/11	Mon 8/22/11
20	Final Inspection	1 day	Thu 8/25/11	Thu 8/25/11

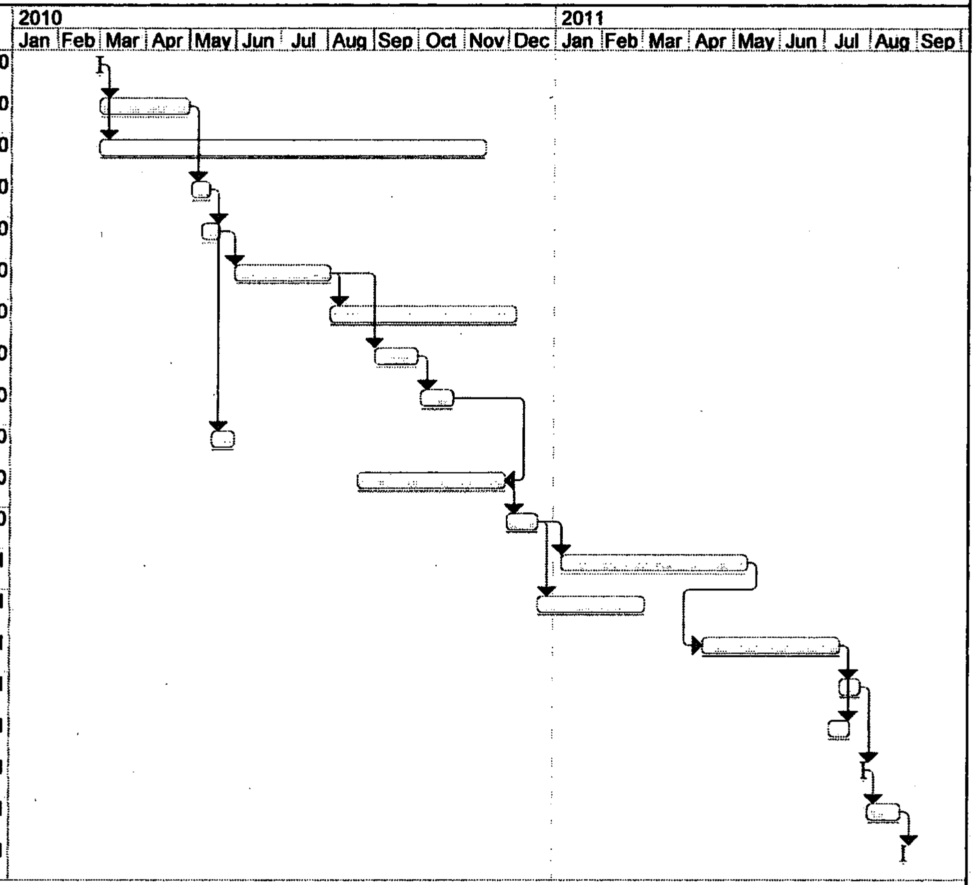

Table 3-1
Equipment List
Old Roosevelt Field Contaminated Groundwater Area Superfund Site
Garden City, New York

Part 1. Groundwater Extraction System

1.1 Equipment

<u>EW-1S Pump</u>	
Quantity	1
Type	Submersible well pump
Operation	Continuous
Design flow rate	60 gpm
Required TDH	89.75 feet
Horsepower	3 HP
Representative Manufacturer	Grundfos
Model	85S30-2
<u>EW-1I Pump</u>	
Quantity	1
Type	Submersible well pump
Operation	Continuous
Design flow rate	60 gpm
Required TDH	94.07 feet
Horsepower	3 HP
Representative Manufacturer	Grundfos
Model	85S30-2
<u>EW-1D Pump</u>	
Quantity	1
Type	Submersible well pump
Operation	Continuous
Design flow rate	80-150 gpm
Required TDH	104.64 feet
Horsepower	7.5 HP
Representative Manufacturer	Grundfos
Model	150S75-4
<u>Pump Discharge Piping</u>	
Type	Stainless steel
Diameter	As per Contract Drawing Sheet-3
Length	As per Contract Drawing Sheet-3

Influent Piping	
Type	HDPE or equal
Diameter	As per Contract Drawing Sheet-3
Length	As per Contract Drawing Sheet-3

1.2 Instrumentation and Controls

As per Section 4.0, Table 4-1, and Contract Drawing Sheet-5 and 6

Part 2. Baseline Groundwater Treatment System

2.1 Equalization Tank T-1

Quantity	1
Type	Polyethylene
Tank capacity	5,600 gallons
Operating volume	4,500 gallons
Approximate dimensions	11.5 feet high 10 feet in diameter
Representative manufacturer	Chem-Tainer.com
Model	5600-gallon Vertical Poly Storage tank

2.2 Transfer Pumps P-1

Quantity	1
Type	Centrifugal pump
Design flow rate (avg)	200 gpm
TDH	89.76 feet
Horsepower	8 HP
Representative manufacturer	Goulds
Model	11AIFRMA5

2.3 Bag Filter BF-1/BF-2

Quantity	2
Hydraulic capacity	200 gpm per unit
Number of bags per filter vessel	1 or 2
Filter Bag Size	
Average:	50 or 100 micron
Representative Manufacturer	Rosedale Products, Inc.
Model	Model 82 Dual Capacity

2.4 Air Stripper System AS-1

Quantity	1
Type	Low Profile, 5-tray
Water Flow Rate	20-400 gpm

Air Flow Rate	2100 cfm
Horsepower	25 HP
Maximum height	9.5 feet
Approximate Skid dimensions	136 in. L x 98 in. W x 122 in. H
Representative manufacturer	Carbonair
Model	STAT 400

2.5 Transfer Pumps P-2

Quantity	1
Type	Centrifugal pump
Design flow rate (avg)	200 gpm
TDH	29.11 feet
Horsepower	8 HP
Representative manufacturer	Goulds
Model	11AIFRMA5

2.6 Chemical Feeding System

2.6.1 Bulk Caustic Storage Tank

Quantity	2 (T-2 & T-5)
Type	Polyethylene
Tank capacity	300 gallons
Approximate dimensions	6.6 feet high 3 feet in diameter
Representative manufacturer	Plastic-Mart.com
Model	300-gallon Vertical Poly Storage tank

2.6.2 Metering Pump MP-1, 2 & 3

Quantity	4
Representative manufacturer	Pulsatron by Pulsafeeder
Solution	Sodium hydroxide Sodium hypochlorite (option) Ferric chloride (option)

Table 3-1
Equipment List
Old Roosevelt Field Contaminated Groundwater Area Superfund Site
Garden City, New York

2.7 Sump Pump SMP-1

Quantity	1
Type	Submersible sump pump
Design flow rate (avg)	16.8 gpm
TDH	16.12 feet
Horsepower	1/3 HP
Representative manufacturer	Goulds
Model	LSP03

2.8 Process Piping (General)

Type	As per Contract Drawing Sheet-6 Schedule 80 PVC or equal
Diameter	As per Contract Drawing Sheet-5

2.9 Instrumentation and Controls

As per Section 4.0, Table 4-1, and Contract Drawing Sheet-5

2.10 Surface Water Discharge System

Outfall	Existing storm sewer manhole
Receiving water body	Nassau County recharge basin 124, groundwater

Part 3. Optional Iron Treatment System

3.1 Greensand Filters GSF-1/GSF-2/GSF-3

Quantity	3
Service hydraulic load	5 gpm per square feet
Backwash flow rate	185 gpm
Backwash time	10 minutes
	4.5 feet in diameter
Representative Manufacturer	Hungerford & Terry, Inc.

3.2 Sludge Settling Tank T-3

Quantity	1
Type	Polyethylene
Tank capacity	5,500 gallons
Approximate dimensions	12.5 feet high 10 feet in diameter
Representative manufacturer	Chem-tainer.com
Model	5500-gallon cone bottom poly tank

3.3 Transfer Pump P-3

Quantity	1
Type	Centrifugal pump
Design flow rate (avg)	50 - 100 gpm
TDH	7.99 – 27.30 feet
Horsepower	3/4 HP
Representative manufacturer	Goulds
Model	4AIFRMJ4

3.4 Sludge Transfer Pump P-4

Quantity	1
Type	progressive cavity pump
Design flow rate (avg)	5-9 gpm
TDH	0-50 psi
Horsepower	½ hp
Representative manufacturer	Moyno
Model	33360

3.5 Sludge Holding Tank T-4

Quantity	1
Type	Polyethylene
Tank capacity	5,500 gallons
Approximate dimensions	12.5 feet high 10 feet in diameter
Representative manufacturer	Chem-tainer.com
Model	5500-gallon cone bottom poly tank

3.6 Clear Water Tank T-7

Quantity	1
Type	Polyethylene
Tank capacity	3,000 gallons
Approximate dimensions	7.5 feet high 10 feet in diameter
Representative manufacturer	Chem-tainer.com
Model	3000-gallon poly tank

3.7 Transfer Pump P-5

Quantity	1
Type	Centrifugal pump
Design flow rate (avg)	190 gpm
TDH	30 feet
Horsepower	3 HP
Representative manufacturer	Goulds
Model	3656 MI 52AL1H2A0

3.8 Piping

Type	As per Contract Drawing Sheet-6 Schedule 80 PVC or equal
Diameter	As per Contract Drawing Sheet-6

3.9 Instrumentation and Controls

As per Section 4.0, Table 4-1, and Contract Drawing Sheet-6

Part 4. Facility

4.1 Building

Type	Pre-engineered, metal building with reinforced concrete slab on grade
Approx. size LxWxH	40x35x20 without iron removal
Approx. size LxWxH	70x40x20 with iron removal
Minimum features	Control room, chemical room, bathroom - 1 x 12' wide retractable vehicle access door - 2 x 36' wide pedestrian access doors - Concrete floor shall include a perimeter berm and be sloped for spill containment - Heating and ventilation for the building - Air conditioning for the electrical/control room - Security alarm - Floor drain and sump equipped with high level control as per Section 4.0 and Table 4-1 - Construction shall conform to state and local building code requirements

Table 3-1
Equipment List
Old Roosevelt Field Contaminated Groundwater Area Superfund Site
Garden City, New York

4.2 Heating and Ventilation System

Heating System Type	Forced air
Heat source	Electric

Table 4-1
Process Instrumentation and Controls Description
Old Roosevelt Field Contaminted Groundwater Area Superfund Site
Garden City, New York

Equipment	Condition	PLC Input	PLC Output[1]	Hardwired Interlock	Alarms: Indication: OIT Display	Alarms: Indication: Auto-Dialer	Alarms: Shutdown: Equipment	Alarms: Shutdown: System[2]	Comments
PLC System									
PLC	Power failure	X			X	X		X	Signal is sent directly to the auto-dialer in addition to the PLC.
PLC	Processor fault		X			X		X	
Emergency Stop Station	Emergency stop	X	X	X	X	X		X	As activated by system operator.
Groundwater Pumping System:									
Well Pumps EW-1S, EW-1I, EW-1D	Pump in hand mode				X				Manual pump operation through the local hand switch.
Well Pumps EW-1S, EW-1I, EW-1D	Pump in automatic mode	X			X				Enables automated pump operation by PLC.
Well Pumps EW-1S, EW-1I, EW-1D	Pump general overload or fault [3]	X	X	X	X	X	Well pumps		General fault condition from pump status box to PLC and from the PLC to the autodialer. Stops the well pump.
Well Pumps EW-1S, EW-1I, EW-1D	Pump running	X			X				Pump on/off status to PLC
Well Pumps EW-1S, EW-1I, EW-1D	Flow indicating transmitter	X	X		X				Flow rate data to PLC, used by PLC to adjust the globe valve for flow control
Motorized globe valve	valve open position	X	X		X				Percentage opening of the valve
Level Transducers	Low level	X	X	X	X	X	Well pumps		Stops the respective well pump.
Influent Header in Well Vault	High pressure	X	X		X	X	Well pumps		Stops the well pumps. Time delay to avoid false trips.
Influent Header at the Plant	Flow indicating transmitter	X			X				Monitor groundwater flow rate into the treatment plant

Table 4-1
Process Instrumentation and Controls Description
Old Roosevelt Field Contaminted Groundwater Area Superfund Site
Garden City, New York

		PLC	PLC		Alarms				
					Indication		Shutdown		
Equipment	Condition	Input	Output[1]	Hardwired Interlock	OIT Display	Auto-Dialer	Equipment	System[2]	Comments
Equalization tank (T-1):									
Equalization Tank	High high level	X	X	X	X	X	Well pumps		Stops well pumps and sends alarm.
Equalization Tank	Low low level	X	X	X	X	X	Transfer pump P-1		Stops transfer pump P-1.
Equalization Tank	Level Indicating transmitter	X			X				Used as process variable in determining pumping rate
Equalization Tank (with greensand filters)	Level Indicate transmitter	X	X		X				Used as process variable in determining pumping rate. See note 7.
Equalization Tank	Low level	X	X		X	X			Send alarm to operator, the operator shall investigate the cause.
Equalization Tank	High level	X	X		X	X			Send alarm to operator, the operator shall investigate the cause. Supernatant transfer pump P-3 can not start
Equalization Tank	pH analyzing transmitter	X			X				Record pH in equalization tank and used as process variable to determine caustic feed
Transfer pump (P-1) [4]									
Transfer Pump P-1	Pump in automatic mode	X			X				Enables automated pump operation by PLC, variable speed based on tank levels.
Transfer Pump P-1	Pump in hand mode				X				Initiates manual pump operation
Transfer Pump P-1	Pump running	X			X				On/off status to PLC
Transfer Pump P-1	Pump failure	X	X		X	X	Pump P-1	X	Shut down pump P-1
Transfer Pump P-1	VFD fault	X	X		X	X	Pump P-1	X	Shut down pump P-1

Table 4-1
Process Instrumentation and Controls Description
Old Roosevelt Field Contaminted Groundwater Area Superfund Site
Garden City, New York

					Alarms				
					Indication		Shutdown		
Equipment	Condition	PLC Input	PLC Output[1]	Hardwired Interlock	OIT Display	Auto-Dialer	Equipment	System[2]	Comments
Transfer Pump P-1	Speed	X			X				Indication of pump speed.
Transfer Pump P-1	Speed reference		X		X				Speed reference signal sent to VFD from PLC.
Bag filters									
Bag Filters	Differential pressure high	X	X		X	X		X	Notifies operator to change bag filter.
Air Stripper System and Transfer Pump (P-2)[4]:									
Blower B-1	Vacumm switch high	X	X	X	X	X		X	Indicating air flow blocked, shut down transfer pump P-1, and the system
Blower B-1	Timed delay during start/stop	X	X	X					Blower B-1 must be on before the well pumps and P-1 are on; Delay shut down of blower after shut down of well pump and P-1.
Blower B-1	Delay re-start of blower after stop	X	X						Allow blower to reach a complete stop before re-start.
Blower B-1	Failure	X	X		X	X		X	Any blower failure the system shall be shut down
Blower B-1	Blower running	X			X				On/off status to PLC from blower.
Air Stripper Sump	High level	X	X	X	X	X	Transfer pump P-1		Stop transfer pump P-1
Air Stripper Sump	Level Transmitter	X	X		X				Used as process variable to control VFD and transfer pump P-2 to maintain constant level in sump

Table 4-1
Process Instrumentation and Controls Description
Old Roosevelt Field Contaminted Groundwater Area Superfund Site
Garden City, New York

Equipment	Condition	PLC Input	PLC Output[1]	Hardwired Interlock	Alarms				Comments
					Indication		Shutdown		
					OIT Display	Auto-Dialer	Equipment	System[2]	
Air Stripper Sump	Low level	X	X	X	X		Transfer pump P-2		Stop transfer pump P-2
Transfer Pump P-2	Pump in automatic mode	X			X				Enables automated pump operation by PLC, variable speed based on air stripper sump levels.
Transfer Pump P-2	Pump in hand mode				X				Initiates manual pump operation.
Transfer Pump P-2	Pump running	X			X				On/off status to PLC.
Transfer Pump P-2	pump general overload or fault [3]	X	X	X	X	X	Pump P-2	X	Stop transfer pump P-2
Transfer Pump P-2	VFD fault	X	X		X	X	Pump P-2	X	Stop transfer pump P-2
Transfer Pump P-2	Speed	X			X				Indication of pump speed.
Transfer Pump P-2	Speed reference		X		X				Speed reference signal sent to VFD from PLC.
Effluent Discharge System:									
Plant Effluent Line	Flow transmitter	X			X				Record effluent flow rate
Level Transducer in Stormwater Manhole	High level	X	X		X	X		X	System shut down. Time delay to avoid false trips.
Plant effluent line	pH indicating transmitter	X			X				Record pH of discharge water. Adjust MP-1A injection rate.

Table 4-1
Process Instrumentation and Controls Description
Old Roosevelt Field Contaminted Groundwater Area Superfund Site
Garden City, New York

					Alarms				
					Indication		Shutdown		
Equipment	Condition	PLC Input	PLC Output[1]	Hardwired Interlock	OIT Display	Auto-Dialer	Equipment	System[2]	Comments
pH Adjustment System									
Metering pump MP-1/MP-1A	Pump in automatic mode	X			X				Enables automated pump operation by PLC.
Metering pump MP-1/MP-1A	Pump in hand mode				X				Initiates manual pump operation
Metering pump MP-1/MP-1A	Pump running	X			X				On/off status to PLC
Metering pump MP-1/MP-1A	pump general overload or fault [3]	X	X	X	X	X	Metering pump MP-1		Stops MP-1 and notify the operator.
Sodium hydroxide tank	Low level	X	X		X	X	Metering pump MP-1		Stop MP-1 and notify the operator
Sodium hydroxide tank	Low low level	X	X		X	X	Metering pump MP-1/MP-1A	X	Stop MP-1/MP-1A and the system. Notify the operator
Metering pump MP-1 (with greensand filters)	pump general overload or fault [3]	X	X	X	X	X	Metering pump MP-1	X	Stops MP-1 and notify the operator. Shut down the system to protect greensand filters.
OPTIONAL IRON REMOVAL SYSTEM:									
Greensand filters[6]	**OPTIONAL**								
Greensand Filters GSF 1, GSF-2, GSF-3	Pressure differential indicate transmitter	X	X		X	X			Indication of differential pressure across the filter media; send alarm to operator if high differential pressure is detected before backwash time is up
Greensand Filters GSF 1, GSF-2, GSF-3	Timer	X			X		Backwash the respective filter		Control the cycle between service and backwash time

Table 4-1
Process Instrumentation and Controls Description
Old Roosevelt Field Contamincted Groundwater Area Superfund Site
Garden City, New York

Equipment	Condition	PLC Input	PLC Output[1]	Hardwired Interlock	Alarms				Comments
					Indication		Shutdown		
					OIT Display	Auto-Dialer	Equipment	System[2]	
Greensand Filters GSF-1, GSF-2, GSF-3	Flow element	X			X				Record flow rate and total volume of groundwater treated
PLC for GSF-1, GSF-2, GSF-3	greensand filters in filtration or backwash mode		X		X		valves		Operate valve open or close based on preset operation and backwash conditions
Influent valve, Effluent valve, backwash valve, waste valve for each filter	Position indicator	X			X				Indicate the valve is open or close
Valve or actuator	malfunction	X	X		X	X	Greensand filters	X	Send alarm to the operator, if individual greensand unit is down, no need to shut down the system, if two or more greensand filters are down, shut down the treatment system
Combined header of backwash waste line	flow switch	X	X		X		MP-3 on or off		detection of flow in waste line will turn on/off ferric chloride metering pump MP-3
Sodium hypochlorite feed system	**OPTIONAL**								
Metering Pump MP-2	Pump in automatic mode	X			X				Enables automated pump operation by PLC.
Metering Pump MP-2	Pump in hand mode				X				Initiates manual pump operation
Metering Pump MP-2	Pump running	X			X				On/off status to PLC

Table 4-1
Process Instrumentation and Controls Description
Old Roosevelt Field Contaminted Groundwater Area Superfund Site
Garden City, New York

					Alarms				
					Indication		Shutdown		
Equipment	Condition	PLC Input	PLC Output[1]	Hardwired Interlock	OIT Display	Auto-Dialer	Equipment	System[2]	Comments
Metering Pump MP-2	pump general overload or fault [1]	X	X	X	X	X	Metering pump MP-2		Stop MP-2 and notify the operator
Sodium hypochlorite tank	Low level	X	X		X	X			Stop metering pump MP-2. Notify the operator to refill
Sodium hypochlorite tank	Low low level	X	X		X	X	Metering pump MP-2	X	Stop metering pump MP-2 and system. Notify the operator
Effluent line of greensand filtration system	Chorine analyzer	X			X				Analyze and record chlorine concentrations after greensand filters
Ferric chloride feed system	**OPTIONAL**								
Metering Pump MP-3	Pump in automatic mode	X			X				Enables automated pump operation by PLC.
Metering Pump MP-3	Pump in hand mode				X				Initiates manual pump operation
Metering Pump MP-3	Pump running	X			X				On/off status to PLC
Metering Pump MP-3	pump general overload or fault [1]	X	X	X	X	X	Metering pump MP-3		Stop MP-3 and notify the operator
Ferric chloride storage tank	Level low	X	X		X	X	Metering pump MP-3		Stop MP-3 and notify the operator to refill
Sludge Handling System:[4]	**OPTIONAL**								
Sludge Settling Tank	High level	X	X		X	X			Send alarm to operator and can not backwash greensand units
Sludge Settling Tank	Low level	X	X		X	X	Transfer pump P-3		Stops transfer pump P-3

Table 4-1
Process Instrumentation and Controls Description
Old Roosevelt Field Contaminted Groundwater Area Superfund Site
Garden City, New York

					Alarms				
					Indication		Shutdown		
Equipment	Condition	PLC Input	PLC Output[1]	Hardwired Interlock	OIT Display	Auto-Dialer	Equipment	System[2]	Comments
Sludge Settling Tank	Timer	X	X		X				Set the settling cycle. Set operation time for the mixer and start transfer pumps P-3 at the end of settling cycle.
Transfer Pump P-3	Pump in automatic mode	X			X				Enables automated pump operation by PLC.
Transfer Pump P-3	Pump in hand mode				X				Initiates manual pump operation.
Transfer Pump P-3	pump general overload or fault [3]	X	X	X	X	X	Pump P-3		Shut down pump P-3, send alarm to operator
Transfer Pump P-3	Pump running	X			X				On/off status to PLC.
PLC for Transfer Pump P-3	Timer	X	X		X				Set frequency and duration of pumping for transfer pump P-3
Sludge Holding Tank	High level	X	X		X	X	Pump P-4		Send alarm to operator
Sludge Transfer Pump P-4	Pump in automatic mode	X			X				Enables automated pump operation by PLC.
Sludge Transfer Pump P-4	Pump in hand mode				X				Initiates manual pump operation.
Sludge Transfer Pump P-4	Pump running	X			X				On/off status to PLC from pump controller, P-4 shut down set by timer.
Sludge Transfer Pump P-4	pump general overload or fault [3]	X	X	X	X	X	Pump P-4		Shut down pump P-3
Sludge Transfer Pump P-4	Timer	X	X		X				Start sludge transfer pump P-4 at the end of settling cycle in sludge settling tank. Running

Table 4-1
Process Instrumentation and Controls Description
Old Roosevelt Field Contaminted Groundwater Area Superfund Site
Garden City, New York

					Alarms				
					Indication		Shutdown		
Equipment	Condition	PLC Input	PLC Output[1]	Hardwired Interlock	OIT Display	Auto-Dialer	Equipment	System[2]	Comments
Plant Effluent Discharge System	**OPTIONAL**								
Discharge line	motorized butterfly valve or globe valve open/close	X	X		X				When filling up clean water tank, the valve to T-7 opens; the valve to manhole closes, vice versa.
Clean Water Tank (T-7)	**OPTIONAL**								
Clean Water Tank	High level	X	X		X		Close butterfly valve on plant discharge line		Close the valve on discharge line connected to the clean water tank, discharge treated water to stormwater manhole
Clean Water Tank	Low level	X	X		X		Stop transfer pump P-5		Stops transfer pump P-5
Transfer Pumps P-5	Pump in automatic mode	X			X				Enables automated pump operation by PLC.
Transfer Pumps P-5	Pump in hand mode				X				Initiates manual pump operation.
Transfer Pumps P-5	pump general overload or fault [3]	X	X	X	X	X	Pump P-5		Shut down pump P-5, cannot backwash greensand filter(s)
Transfer Pumps P-5	Pump running	X			X				On/off status to PLC.
PLC	Timer	X	X		X				Set the time for transfer pump P-5 to operate in coordination with backwash cycle

Table 4-1
Process Instrumentation and Controls Description
Old Roosevelt Field Contaminted Groundwater Area Superfund Site
Garden City, New York

Equipment	Condition	PLC Input	PLC Output(1)	Hardwired Interlock	Alarms				Comments
					Indication		Shutdown		
					OIT Display	Auto-Dialer	Equipment	System(2)	
<u>**Spill Containment System:**</u>									
Sump Pump (SMP-1)	Pump in automatic mode	X			X				Enables automated pump operation by sump pump controller.
Sump Pump (SMP-1)	Pump in hand mode				X				Initiates manual pump operation.
Sump Pump (SMP-1)	Pump running	X			X				On/off status to PLC from pump.
Sump	High level (6)	X	X		X	X			Starts sump pump.
Sump	Low level (6)	X	X		X		sump pump (SMP-1)		Stops sump pump.
Sump	High high level	X	X	X	X	X		X	Shuts down system.
Chemical Storage Tank Containment	High level	X	X		X	X			check if chemical storage tanks leak

<u>Notes:</u>
(1) Conditions and flow data will be shown on the OIT.
(2) System shut-downs include shut down of all pumps and the blower. Well pump shall be shut down first, blower shall be shut down with time delay to prevent discharge of untreated water.
(3) General fault conditions include, overvoltage, under voltage, speed reduction, over temperature, and overload.
(4) Transfer pump operation will alternate between the two pumps.
(5) Greensand control system including the controls for sodium hypochlorite feed system will be provided by the vendor. The controls shown in this table are minimal description of the controls the greensand vendor shall provide. Vendors control system shall include an interface to be integrated into the treatment system PLC.
(6) High and low level controls are integral to the sump pump design. The sump pump is not controlled by the PLC.

Table 4-1
Process Instrumentation and Controls Description
Old Roosevelt Field Contaminted Groundwater Area Superfund Site
Garden City, New York

Equipment	Condition	PLC Input	PLC Output(1)	Hardwired Interlock	Alarms: Indication: OIT Display	Alarms: Indication: Auto-Dialer	Alarms: Shutdown: Equipment	Alarms: Shutdown: System(2)	Comments

(7) With greensand filters in the treatment train, it is assumed that the backwash supernatant will be periodically pumped from the sludge settling tank into the equalization tank. This additional volume of water shall be distributed evenly to the subsequent treatment components over time. Therefore, the PLC will be programmed so that as water level increases from a preset water level A, the PLC will control the transfer pump P-1 to increase pumping rate proportionally up to a preset maximum. This preset maximum pumping rate shall be slightly higher than the influent flow rate. The water level in the equalization tank will increase until transfer pump P-3 stops. When the water level drops back to level A, the PLC will control the pump P-1 to operate at the same flow rate as infuent. The volume in equalization tank between level A and the high water level shall be greater than the volume of supernatant to be transferred into the equalization tank.

DGW - discharge to groundwater
NYSPDES - New York State Pollutant Discharge Elimination System
OIT - operator interface terminal
PLC - programmable logic controller
VFD - variable frequency drive

Table 5-1
Initial Testing Program (ITP) Sampling and Monitoring Schedule
Old Roosevelt Field Contaminated Groundwater Area Superfund Site
Garden City, New York

ACTIVITY	LOCATIONS	PARAMETERS[5]	FREQUENCY
14-day Operational Test:			
Step-1, individual well testing [1]			
Water level measurements	Monitoring wells[2]	Water levels	Using data logger
Influent sampling	Influent sample ports	VOC, Total Iron	1 per day (min)
Influent monitoring	Influent sample ports	Water quality parameters[3]	1 per day (min)
	Flow and pressure indicators	Flow, pressure	1 per day (min)
Process sampling	After equalization tank	VOCs, Total Iron	1 per day (min)
	Effluent sample port	Per NYSDEC SPDES permit equivalent requirements [4]	1 per day (min)
Process monitoring	pH indicating transmitter in equalization tank	pH	continuous
	After equalization tank	Water quality parameters[3]	1 per day (min)
	pH indicating transmitter on effluent line	pH	continuous
	Flow and pressure indicators	Flow, pressure	1 per day (min)
Offgas system sampling	Sample port on air stripper offgas effluent line	VOCs via TO-14	1 per day (min)
Optional Testing			
Process sampling	After greensand filtration system, effluent line	Total iron	1 per day (min)
Process monitoring	Flow and pressure indicators on greensand filtration system	Flow, pressure	1 per day (min)
	After greensand filtration system, effluent line	Cl	continuous
Step-2, all three extraction wells in operation			
Water level measurements	Monitoring wells[2]	Water levels	Using data logger
Influent sampling	Influent sample ports	VOC, Total Iron	1 per day (min)
Influent monitoring	Influent sample ports	Water quality parameters[3]	1 per day (min)
	Flow and pressure indicators	Flow, pressure	1 per day (min)
Process sampling	After equalization tank	VOCs, Total Iron	1 per day (min)
	Effluent sample port	Per NYSDEC SPDES permit equivalent requirements [4]	1 per day (min)
Process monitoring	pH indicating transmitter in equalization tank	pH	continuous
	After equalization tank	Water quality parameters[3]	1 per day (min)
	pH indicating transmitter on effluent line	pH	continuous
	Flow and pressure indicators	Flow, pressure	1 per day (min)

Table 5-1
Initial Testing Program (ITP) Sampling and Monitoring Schedule
Old Roosevelt Field Contaminated Groundwater Area Superfund Site
Garden City, New York

ACTIVITY	LOCATIONS	PARAMETERS[5]	FREQUENCY
Offgas system sampling	Sample port on air stripper offgas effluent line to roof stack	VOCs via TO-14	1 per week (min)
Offgas system monitoring	The offgas effluent pipe port	VOCs via PID	1 per day (min)
Optional Testing			
Optional process sampling	After greensand filtration system	Total iron	1 per day (min)
	Supernantant in sludge settling tank before being circulated to equalization tank	Total iron	1 per day (min)
	Sludge sample port on the sludge effluent line at the bottom of sludge settling tank	TSS	4 during pumping cycle (min) [6]
Optional process monitoring	Flow and pressure indicators	Flow, pressure	1 per day (min)
	After greensand filtration system, effluent line	Cl	continuous
Disposal sampling	Sludge holding tank	As required by disposal facility	disposal facility
48-hour Operational Test Same as step-2 under 14-day operational test			

NOTES:

1. Groundwater extraction wells EW-1S, EW-1I, and EW-1D are tested individiually at design capacity. Each test will be conducted at a minimum of one day.
2. Well list: GWX-10019, GWX-10020, MW-01(S,I), SVP-10
3. Monitoring parameters: dissolved oxygen, pH, conductivity, temperature, oxidation-reduction potential.
4. As per NYSDEC SPDES permit equivalent requirements.
5. Sample analysis should be conducted in accordance with specification 01451-CHEMICAL DATA QUALITY CONTROL.
6. During the pumping cycle, the sludge at the bottom of the sludge settling tank will be pumped into the sludge holding tank. The Contractor shall collected sludge samples at the beginning and overtime and test for TSS in order to evalutate the quantity of sludge generated duirng each backwash cycle.

min - minimum

NYSDEC - New York State Department of Environmental Conservation

SPDES - State Pollutant Discharge Elimination System

PID - photo-ionization detector

VOCs - volatile organic compounds

Table 6-1
Groundwater Monitoring Program
Old Roosevelt Field Contaminated Groundwater Area Superfund Site
Garden City, New York

Well Type	Well ID	Port	Ground Surface Elevation (feet amsl)	Measurement Port Depth (feet BTOC)	Port Elevation (feet amsl)	Quarterly Monitoring (Q1,Q2,Q3) For VOCs	Annual Monitoring (Baseline & Annual) For VOCs	Synoptic Water Level	
								Quarterly	Continuous
Multiport Well	SVP-2	1	89.39	455	-365.6		X	X	
		2	89.39	418	-328.6		X	X	
		3	89.39	378	-288.6		X	X	
		4	89.39	338	-248.6		X	X	
		5	89.39	298	-208.6		X	X	
		6	89.39	258	-168.6		X	X	
		7	89.39	198	-108.6		X	X	
		8	89.39	158	-68.6		X	X	
		9	89.39	108	-18.6		X	X	
		10	89.39	58	31.4			X	
Multiport Well	**SVP-3**	1	87.17	455	-367.8			X	
		2	87.17	398	-310.8		X	X	
		3	87.17	378	-290.8		X	X	
		4	87.17	298	-210.8		X	X	
		5	87.17	178	-90.8		X	X	
		6	87.17	108	-20.8			X	
		7	87.17	58	29.2			X	
Multiport Well	**SVP-4**	1	88.85	425	-336.2		X	X	
		2	88.85	405	-316.2	X	X	X	
		3	88.85	358	-269.2	X	X	X	
		4	88.85	313	-224.2	X	X	X	
		5	88.85	293	-204.2	X	X	X	
		6	88.85	253	-164.2	X	X	X	
		7	88.85	193	-104.2	X	X	X	
		8	88.85	153	-64.2		X	X	
		9	88.85	108	-19.2		X	X	
		10	88.85	53	35.9			X	
Multiport Well	**SVP-5**	1	85.55	435	-349.5		X	X	
		2	85.55	413	-327.5		X	X	
		3	85.55	363	-277.5		X	X	
		4	85.55	318	-232.5		X	X	
		5	85.55	298	-212.5		X	X	
		6	85.55	258	-172.5		X	X	
		7	85.55	198	-112.5		X	X	
		8	85.55	158	-72.5		X	X	
		9	85.55	103	-17.5		X	X	
		10	85.55	53	32.6			X	
Multiport Well	**SVP-9**	1	89	482	-393.0		X	X	
		2	89	402	-313.0		X	X	
		3	89	352	-263.0		X	X	
		4	89	307	-218.0		X	X	
		5	89	287	-198.0		X	X	
		6	89	247	-158.0		X	X	
		7	89	187	-98.0		X	X	
		8	89	147	-58.0		X	X	
		9	89	102	-13.0		X	X	
		10	89	47	42.0			X	

Table 6-1
Groundwater Monitoring Program
Old Roosevelt Field Contaminated Groundwater Area Superfund Site
Garden City, New York

Well Type	Well ID	Port	Ground Surface Elevation (feet amsl)	Measurement Port Depth (feet BTOC)	Port Elevation (feet amsl)	Quarterly Monitoring (Q1,Q2,Q3) For VOCs	Annual Monitoring (Baseline & Annual) For VOCs	Synoptic Water Level Quarterly	Synoptic Water Level Continuous
Multiport Well	SVP-10	1	87	482	-395.0	X		X	
		2	87	402	-315.0	X		X	
		3	87	352	-265.0	X		X	
		4	87	307	-220.0	X		X	
		5	87	287	-200.0	X		X	
		6	87	247	-160.0	X		X	
		7	87	187	-100.0	X		X	
		8	87	147	-60.0		X	X	
		9	87	102	-15.0		X	X	
		10	87	47	40.0			X	
Multiport Well	SVP-11	1	82.5	482	-399.5		X	X	
		2	82.5	402	-319.5		X	X	
		3	82.5	352	-269.5		X	X	
		4	82.5	307	-224.5		X	X	
		5	82.5	287	-204.5		X	X	
		6	82.5	247	-164.5		X	X	
		7	82.5	187	-104.5		X	X	
		8	82.5	147	-64.5		X	X	
		9	82.5	102	-19.5		X	X	
		10	82.5	47	35.5			X	
Regular Monitoring Wells	GWX-10019		85.52	-137.48 to -142.48		X	X		X
	GWX-10020		81.66	-103.34 to -108.34			X		X
	MW-01S			-50		X	X		X
	MW-01I			-225		X	X		X
	MW-02S			-50					X
	MW-02I			-225					X
	MW-03S			-50					X
	MW-03I			-225					X
	EW-1S			-125 to -185					X
	EW-1I			-195 to -255					X
	EW-1D			-265 to -325					X
Multiport Well	SVP-01	All sample ports					See note 1		
	SVP-06	All sample ports					See note 1		
	SVP-07	All sample ports					See note 1		
	SVP-08	All sample ports					See note 1		
	SVP-12	All sample ports					See note 1		
	SVP-13	All sample ports					See note 1		

Notes:
1. Sample will be collected from these four multiport wells duirng the baseline sampling event and every five years afterward.
no sample collection at these ports
amsl - above mean sea level
BTOC - below top of casing
Atm. - atmospheric
psi - pounds per square inch

Table 6 - 2
GWTF Compliance and Performance Monitoring Schedule
Old Roosevelt Field Contaminated Groundwater Area Superfund Site
Garden City, New York

ACTIVITY	LOCATIONS	PARAMETERS[3]	FREQUENCY
Influent sampling	Influent sample ports	VOC, Total Iron	As required, monthly (min)
Influent monitoring	Influent sample ports	Water quality parameters[1]	Weekly (min)
	Flow and pressure indicators	Flow, pressure	Weekly (min)
Process sampling	After equalization tank, effluent sample port	VOCs, Total Iron	As required, monthly (min)
Process monitoring	After equalization tank	Water quality parameters[1]	Weekly (min)
	pH indicating transmitter in equalization tank	pH	continueous
	pH indicating transmitter on effluent line	pH	continueous
	Flow and pressure indicators	Flow, pressure	Weekly (min)
Effluent compliance sampling	Effluent sample port	Refer to Note 2	Refer to Note 2
Offgas system sampling	Sample port on air stripper offgas effluent line to roof stack	VOCs via TO-14	Weekly for months 0-6; biweekly for months 6-12
Offgas system monitoring	The offgas effluent pipe port	VOCs via PID	Weekly (min)
Optional Iron Removal System			
Optional process sampling	After greensand filtration system	Total iron	As required, monthly (min)
	Supernantant in sludge settling tank before being circulated to equalization tank	Total iron	As required, monthly (min)
Optional process monitoring	Flow and pressure indicators	Flow, pressure	Weekly (min)
	Chlorine analyzer on effluent line of greensand filters	Cl	continueous
Disposal sampling	Sludge holding tank	As required by disposal facility	As required by disposal facility

NOTES:
1. Monitoring parameters: dissolved oxygen, pH, conductivity, temperature, oxidation-reduction potential.
2. As per NYSDEC SPDES permit equivalent requirements.
3. Sample analysis should be conducted in accordance with specification 01451-CHEMICAL DATA QUALITY CONTROL.

GWTF - groundwater treatment facility
NYSDEC - New York State Department of Environmental Conservation
SPDES - State Pollutant Discharge Elimination System
min - minimum
PID - photo-ionization detector
VOCs - volatile organic compounds

Table 7-1
Summary of Permit Equivalencies and Approvals
Old Roosevelt Field Contaminated Groundwater Area Superfund Site
Garden City, New York

Permit/Approval	Authority	Contact Name/ Number
SPDES Remediation Discharge to Surface or Groundwaters	Remedial Bureau A, Division of Environmental Remediation, NYSDEC, 625 Broadway, 11th Floor, Albany, NY 12233-7015	Heather Bishop, (518) 402-9692
Air Pollution Control Registration Certificate	Remedial Bureau A, Division of Environmental Remediation, NYSDEC, 625 Broadway, 11th Floor, Albany, NY 12233-7016	Heather Bishop, (518) 402-9692
Soil Erosion and Sediment Control Permit	Remedial Bureau A, Department of Environmental Remediation, NYSDEC, 625 Broadway, 11th Floor, Albany, NY 12233-7017	Heather Bishop, (518) 402-9692
Long Island Well Permit	Regional Permit Administrator, Region 1, NYSDEC	Roger Evans, (631) 444-0365
Discharge of Treated Water to Nassau County Recharge Basin	Raymond A. Rabiero, Commissioner, NCDPW, 1194 Prospect Avenue, Westbury, NY 11590	Gerard B. Ennis, Hazardous Waste Unit, NCDPW, (516) 571 6986
Building Permits and Planning & Zoning Board Approval	Building Department, Incorporated Village of Garden City, 351 Stewart Avenue, Garden City, NY	Christopher Markin, P.E. Village Engineer, (516) 465-4008
Connecting to Water Main	Department of Public Works, Incorporated Village of Garden City	Frank Koch, Water Superintendent (516) 465 4017

Notes:
NY - New York
NYSDEC - New York State Department of Environmental Conservation
NCDPW - Nassau County Department of Public Works
P.E. - Professional Engineer
SPDES - State Pollution Discharge Elimination System

Figures

adapted from NYSDEC Interactive Mapping Gateway: http://www.nygis.state.ny.us/gateway/index.html

CDM

0.25 0.125 0 0.25 Miles

Figure 1-1
Site Map
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

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Figure 1-2
Monitoring Well Locations
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York

CDM

Appendix A

Appendix A

Groundwater Modeling

CDM

Memorandum

To: *Susan Schofield, Grace Chen, Thomas Mathew, and Ali Rahmani*

From: *Karilyn Heisen, Dan O'Rourke, and Bob Fitzgerald*

Date: *August 28, 2008*

Subject: *Old Roosevelt Field Groundwater Model: Additional Refinements, Calibration, and Simulations for Design of a Pump and Treat System*

CDM performed additional calibration and evaluated remediation pumping scenarios using the Old Roosevelt Field groundwater model. The development of the groundwater model was documented in a technical memorandum dated August 13, 2007, which also serves as Appendix A in the Feasibility Study (FS). This memorandum documents additional model refinement, calibration and mass transport simulations used to evaluate remedial alternatives in support of the remedial design.

Old Roosevelt Field is located in Garden City, Nassau County, New York. The site is currently occupied by the Roosevelt Field Mall and other commercial development. Locations of major roads, multi-port wells, USGS observation wells and public supply wells near the site are shown on **Figure 1**. Impacted public supply wells include the Garden City wells 10 and 11 (N-03934 and N-03935) located at the south end of the site along Clinton Road.

Model Refinement and Calibration

Model parameters were adjusted to improve model calibration to measured water levels in site multi-port wells SVP-1 to SVP-8 installed as part of the Remedial Investigation (RI) in 2005 and 2006 (**Figure 1**). Revisions to the groundwater model included refinement of the model grid and layers, adjustment of groundwater recharge, revision of model stratigraphy and adjustment of hydraulic conductivities. Water levels measured in multi-port wells in April and July of 2006 were used as calibration targets.

Model Grid

Additional nodes and elements were added in the area of the Nassau County recharge basin number 124, located south of the Garden City wells. This location is being evaluated as a potential recharge site for treated water from the proposed pump and treat system. The model grid was refined to better evaluate mounding impacts due to recharge of treated effluent.

Vertical discretization was also added to the model to facilitate evaluation of pump and treat options. The middle Magothy aquifer was vertically subdivided with the addition of four levels and layers. The revised model used for transport simulations in this memo has 15 levels and 14 layers.

Recharge
Recharge from precipitation was adjusted based on heads in multi-port wells. The area is highly developed with extensive parking lots. Run-off is recharged to large recharge basins, located southeast and southwest of the site. Based on the extent of impervious cover and the heads in the multi-port wells, recharge was decreased near the site to be consistent with modeled recharge south and west of the site. This change results in a decrease in the average recharge from precipitation of 31.9 inches per year from 2000 to 2005 to an average of 21.5 inches per year at the site. Recharge associated with sewer and water pipe leakage was reassigned to account for the additional model elements and nodes near the site, but the total pipe leakage recharge was not increased.

Model Stratigraphy and Aquifer Properties
Model stratigraphy, shown in **Figure 2**, was revised based on cross-sections and boring log information from the USGS (Eckhardt and Pearsall 1989) as well as well completion reports obtained from Nassau County Department of Public Works (NCDPW) and the New York State Department of Conservation (NYSDEC). Adjustments to the stratigraphy included adjustments to the top elevation of the basal Magothy aquifer and removal of the hypothesized buried valley in the upper glacial aquifer between N-03935 (Garden City well 11) and SVP-8. The buried valley was included in previous versions of the groundwater model based on gamma log information from SVP-7, however other nearby boring logs do not indicate the presence of this valley.

Hydraulic conductivity assignments were adjusted based on calibration to water levels measured in multi-port wells in April and July 2006. **Table 1** shows the horizontal and vertical hydraulic conductivity values derived from this calibration. Adjustments to horizontal hydraulic conductivity were minor. Vertical hydraulic conductivity assignments in the Magothy were increased such that the ratio of horizontal to vertical conductivity is 50-60 to 1 in the Magothy aquifer, compared with the previous version of the groundwater model which had an anisotropy ratio of 100 to 1 in the Magothy. The change in anisotropy was based on vertical gradients observed in the multi-port wells.

Calibration Results
Simulated water levels at the site show seasonal fluctuations of more than 10 feet during some years. Water levels are typically lowest in late August or September and peak in April or May. Observed water levels are available for April and July 2006, close to the simulated high water levels. Simulated water levels from 2000 to 2007 and observed water levels in 2006 are shown for multi-port wells in **Figures 3, 4, 5** and **6**. Multi-port wells are numbered from 1 to

10 at each location, in which port 1 is screened deepest in the aquifer. Observed vertical gradients range from 0.0048 ft/ft to 0.037 ft/ft, with an average vertical gradient on-site of 0.0065 ft/ft.

Table 1
Model Properties

Aquifer	Model Layer(s)	Horizontal Conductivity, Kh (feet/day)	Vertical Conductivity, Kv (feet/day)
Upper Glacial	9, 10	200	20
Upper Magothy	8	35	0.6
Middle Magothy	5, 6, 7	40	0.7
Basal Magothy	3, 4	60	1.2

Table 2 shows calibration statistics of the difference between simulated and measured head at the multi-port wells for each water level round. The mean difference is less than 1 foot and the standard deviation of the differences is less than 10% of the range of measurements, indicating a satisfactory match to the data. The largest deviation between simulated and measured heads occurs in the upper glacial monitoring well ports south of the site. The model reproduces observed water levels very well in the Magothy aquifer on-site, where the proposed remedial pumping will take place.

Table 2
Calibration Statistics for Multi-port Wells

Water Level Round	Mean Difference (ft)	Standard Deviation (ft)	Range of Measurements (ft)
April 2006	-0.738	2.048	22.3
July 2006	-0.199	1.764	26.6

Simulated and observed water levels from four USGS observation wells are shown in **Figure 7**. These include one well screened in the upper glacial aquifer (N-10035), two wells screened in the Magothy (N-08269 and N-11396) and one well screened in the Lloyd aquifer (N-11570). The model adequately simulates observed water levels north of the site in the upper Magothy at N-08269. South of the site at N-10035, the model simulated water levels in the upper glacial aquifer are low, similar to the low model results in shallow ports at SVP-7. West of the site, the model adequately simulates water levels in the basal Magothy and Lloyd aquifers.

Figure 8 shows simulated head contours (blue lines) and flow direction vectors (gray arrows) for the middle Magothy Aquifer (model layer 8) in December 2006. Groundwater generally flows north to south in the area west of the site and from the northeast to southwest in the area east of the site. On-site the ground water vectors show the strong influence of the Garden City wells.

Simulation of Remedial Alternatives

Remedial alternatives to address groundwater contamination by TCE and PCE were evaluated using the calibrated groundwater flow model. Steady state and transient flow simulations of alternative scenarios were conducted. Solute transport simulations utilizing the simulated flow fields were conducted to compare contaminant removal and supply well concentrations for the alternative scenarios.

Simulated Alternatives
The Limited Action Alternative (LAA) simulates the continuation of current pumping rates at the Garden City wells with no remedial pumping. This alternative was used as a baseline to compare with the proposed remedial pumping scenario.

The Pump and Treat Alternative (PT) simulates an extraction well, EW-01, located at the edge of a parking lot approximately 600 feet north of the Garden City wells as shown on **Figure 9**. In this alternative, treated water is recharged to the Nassau County recharge basin 124, located south of the Garden City supply wells. EW-01 has three 60 foot screens with a total pumping rate of 200 gpm as shown in **Table 3**. The well is screened in the middle of the Magothy aquifer from an elevation of -125 ft to -325 ft.

Table 3
Remediation Well Depths and Pumping Rates

Well	Well Screen Elevation (ft, msl)	Pumping Rate (gpm)
EW-01 (S)	-125 to -185	60
EW-01 (I)	-195 to -255	60
EW-01 (D)	-265 to -325	80

The location and pumping rate of EW-01 was selected to capture the 100 ppb portion of the TCE and PCE plume (at and upgradient of the extraction wells) while minimizing impacts to head at the Garden City wells. Impacts to water levels at the Garden City wells due to pumping at EW-01 were modeled using long-term steady-state conditions. Pumping 200 gpm from EW-01 results in a maximum simulated drawdown of 0.3 ft at N-03934 (well 10) and 0.2 ft at N-03935 (well 11). A higher pumping rate was assigned to the deeper screen in order to capture elevated concentrations of TCE/PCE at the base of the plume (approximately -350 ft, msl).

Simulated Pump and Treat (PT) Capture Zones
Simulated capture zones for the pump and treat scenario were developed for various depths in the aquifer in order to ensure capture of TCE and PCE concentrations greater than or equal to 100 ppb upgradient (north-northeast) of the recovery well system (although much of the ≥ 5 ppb portion of the plume is also captured). The capture zones were developed using a steady state simulation of the remedial pumping/recharge. Average areal recharge and water supply pumping based on the 5 year period from 2003 to 2007 was assigned. EW-01 was pumped at a total of 200 gpm, as specified in **Table 3**. Pumping at Garden City wells for the steady-state conditions was 387.1 gpm at N-03934 (well 10) and 417.8 gpm at N-03935 (well 11). **Figure 10** shows the area of hydraulic capture to EW-01 in the aquifer at -50, -225 and -350. The area in blue will be captured by the shallow well, EW-01 (S). The area in green will be captured by the intermediate well, EW-01 (I) and area in yellow will be captured by the deep well, EW-01 (D). The capture zone includes the areas of hydraulic capture to EW-01 within 15 years. Portions of the plume that are outside the capture zones, primarily south of EW-01, will be removed by the Garden City wells. Long-term average simulated head contours and flow direction vectors at various portions of the aquifer are also shown in **Figure 10**.

Solute Transport Simulations
Solute transport simulations were developed using simulated transient groundwater flow fields. For each alternative, 30-year flow simulations were conducted using monthly areal recharge and water supply pumping data for the period from 2003 to 2007, repeated six times to model seasonal and annual hydrologic variations over thirty years.

Transport Properties
Magothy aquifer transport properties are shown in **Table 4**. Transport parameters were taken from the FS simulations and are based on typical values used in various groundwater models on Long Island. Since the actual effective porosity at the site is not known, a range of effective porosities was used for the FS. For these simulations an effective porosity of 0.2 was used, consistent with the high end of the range of effective porosities modeled during the FS. The larger effective porosity provides more conservative estimates of clean-up times.

Table 4
Transport Parameters for TCE and PCE in the Magothy Aquifer

Compound	Retardation Factor (dimensionless)	Effective Porosity (dimensionless)	Longitudinal / Transverse Dispersivity (ft)	Vertical Dispersion Anisotropy Ratio (dimensionless)
TCE	1.3	0.2	30 / 3	0.1
PCE	1.8	0.2	30 / 3	0.1

Starting TCE and PCE Plumes

The estimated initial TCE and PCE plumes are based on concentration contours defined in the Remedial Investigation (RI) and modeled in the FS. Slight revisions were made to the TCE plume by expanding the width of the 150 and 250 ppb contours near SVP-4. Plan views showing the initial extent of the estimated TCE and PCE plumes are shown on **Figures 11 and 12**, respectively.

Transport simulations assumed that the source was removed. The existing plume, as delineated based on observed data, was used in the model and a continuous source was not simulated.

Simulated TCE Concentrations

Transport of the initial TCE plume shown in **Figure 11** was simulated using both the LAA and PT alternatives. **Figure 13** shows the plan view distribution of the maximum simulated TCE concentration in any model layer after 10 years for the LAA on the left and the PT on the right. Maximum TCE concentrations simulated in the LAA alternative after 10 years are approximately 80 ppb and some simulated mass has migrated past the Garden City wells. TCE concentrations south of the Garden City wells are over 5 ppb with concentrations in some areas exceeding 50 ppb. The PT alternative, shown on the right in **Figure 13**, decreases the extent and maximum TCE concentration in the plume after 10 years. The extent of the plume at 5 ppb extends from just north of EW-01 to the Garden City wells. Concentrations south of the Garden City wells are less than 5 ppb. The maximum concentration in the plume is just over 50 ppb near EW-01.

The PT alternative simulation decreased TCE concentrations in the Garden City wells below 5 ppb in 6 years as compared with 10 to 11 years with the LAA. TCE concentrations in the Garden City wells are simulated to drop below 1 ppb in 7 to 8 years for the PT alternative and 12 to 13 years with the LAA. This comparative analysis was conducted to evaluate the change in clean-up times between the two alternatives and is based on the plume as depicted in Figures 11 and 12. Clean-up times are subject to change should the delineation of the starting plume be modified.

Figure 14 shows simulated TCE concentrations at EW-01 for each 60 foot screen. Concentrations of TCE in the remediation well are simulated to fall below 5 ppb in 9 to 11 years and below 1 ppb in 11 to 14 years. These concentrations are based on the TCE plume as it is incorporated from the RI/FS (with slight adjustment as mentioned above). These concentrations/durations are subject to change should the initial conditions of the plume be modified.

PCE Concentrations

Transport of initial PCE plume shown in **Figure 12** was simulated using both the LAA and PT alternatives. **Figure 15** shows the plan view of the maximum simulated PCE concentration in any model layer after 10 years for the LAA on the left and the PT on the right. For the LAA, maximum PCE concentrations after 10 years are around 120 ppb. For this alternative, the Garden City wells contain most of the PCE plume. The PT alternative, shown on the right in **Figure 15**, decreases the extent and maximum PCE concentration in the plume. The maximum concentration in the plume, near EW-01, is just under 80 ppb.

The PT alternative simulation decreased PCE concentrations in the Garden City wells below 5 ppb in 2 to 4 years as compared with 2 to 10 years with the LAA. PCE concentrations in the Garden City wells are simulated to drop below 1 ppb in 6 to 7 years for the PT alternative and 14 to 16 years with the LAA. Again, this comparative analysis was conducted to evaluate the change in clean-up times between the two alternatives and is based on the plume as depicted in **Figures 11** and **12**. Clean-up times are subject to change should the delineation of the starting plume be modified.

Figure 16 shows simulated PCE concentrations at EW-01 for each well screen. Concentrations of PCE in the remediation well are simulated to fall below 5 ppb in 8 to 13 years and below 1 ppb in 10 to 17 years. It should be noted that these concentrations are based on the plume delineation, as incorporated from the RI/FS. Should additional information become available and the concentrations/extent of the plume be modified, the concentrations in the recovery wells are subject to change.

Summary and Conclusions

The Old Roosevelt Field groundwater model was refined and recalibrated to water level data collected from site multi-port monitoring wells. The model was used to evaluate proposed remedial alternatives. Comparison of model simulation results for the pump and treat alternative (PT) with well EW-01 and the limited action alternative (LAA) supports the following conclusions:

- Pumping at a rate of 200 gpm at EW-01 will lower head at N-03934 (well 10) and N-03935 (well 11) by less than 0.3 feet.
- The PT alternative will reduce clean-up time of TCE, to concentrations below 5ppb, in the Garden City wells by 4 to 5 years as compared to the LAA, assuming no continuing source.
- The PT alternative will reduce clean-up time of PCE, to concentrations below 5ppb, in the Garden City wells by 0 to 6 years as compared to the LAA, assuming no continuing source.
- EW-01 will capture most on-site mass in the aquifer north of the extraction well from an elevation of -50 ft to -350 ft.

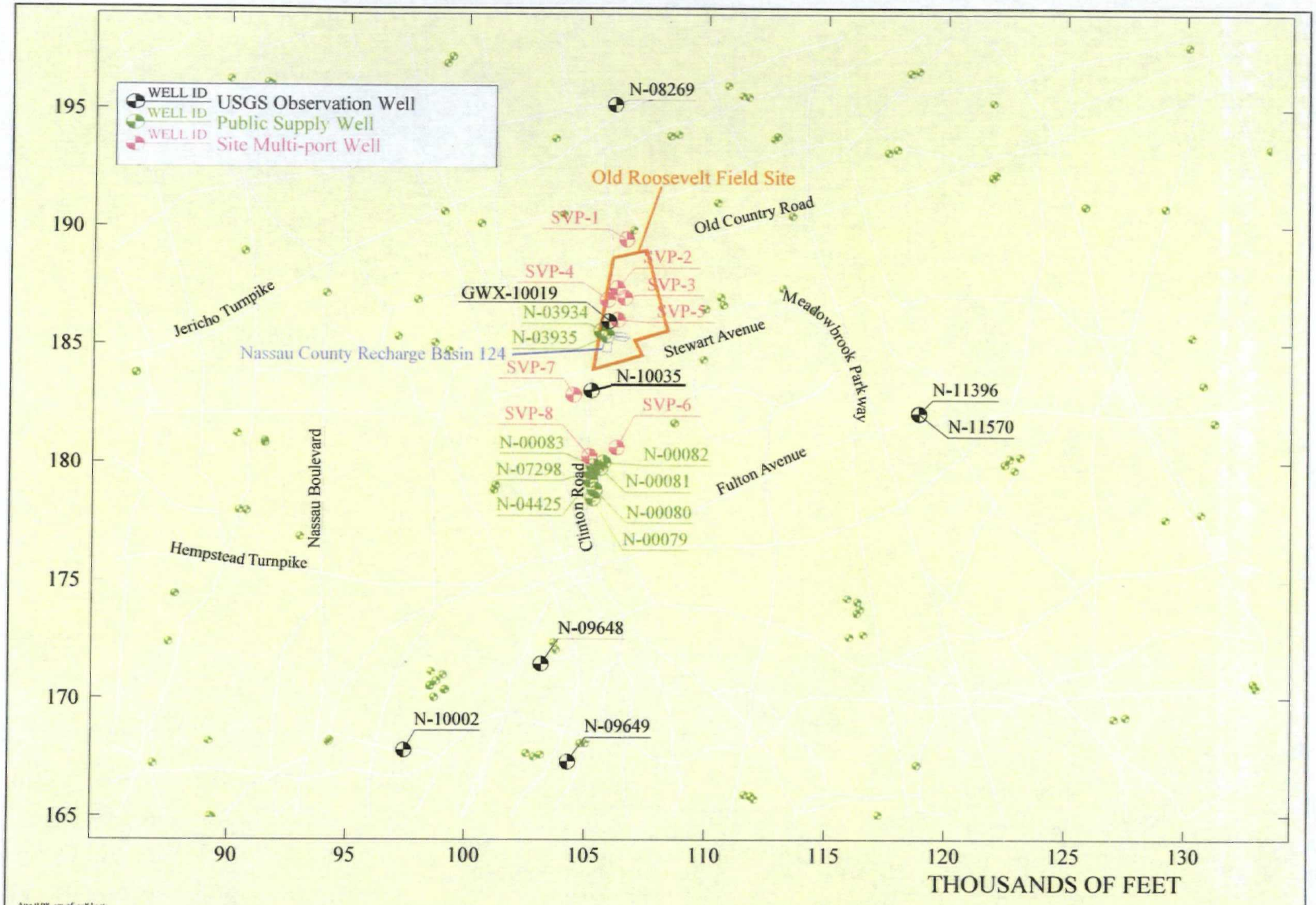
These conclusions are based on the following assumptions:

- The existing plume, as delineated in the RI/FS and based on observed data, was used in the model and no continuing source was simulated.

- Nassau County recharge basin 124 will be able to receive and recharge the treated water from EW-01 in addition to storm flows.

- Future pumping at Garden City and other public supply wells will be similar to pumping rates from 2003 to 2007. Future recharge from precipitation will be similar to recharge during 2003 to 2007.

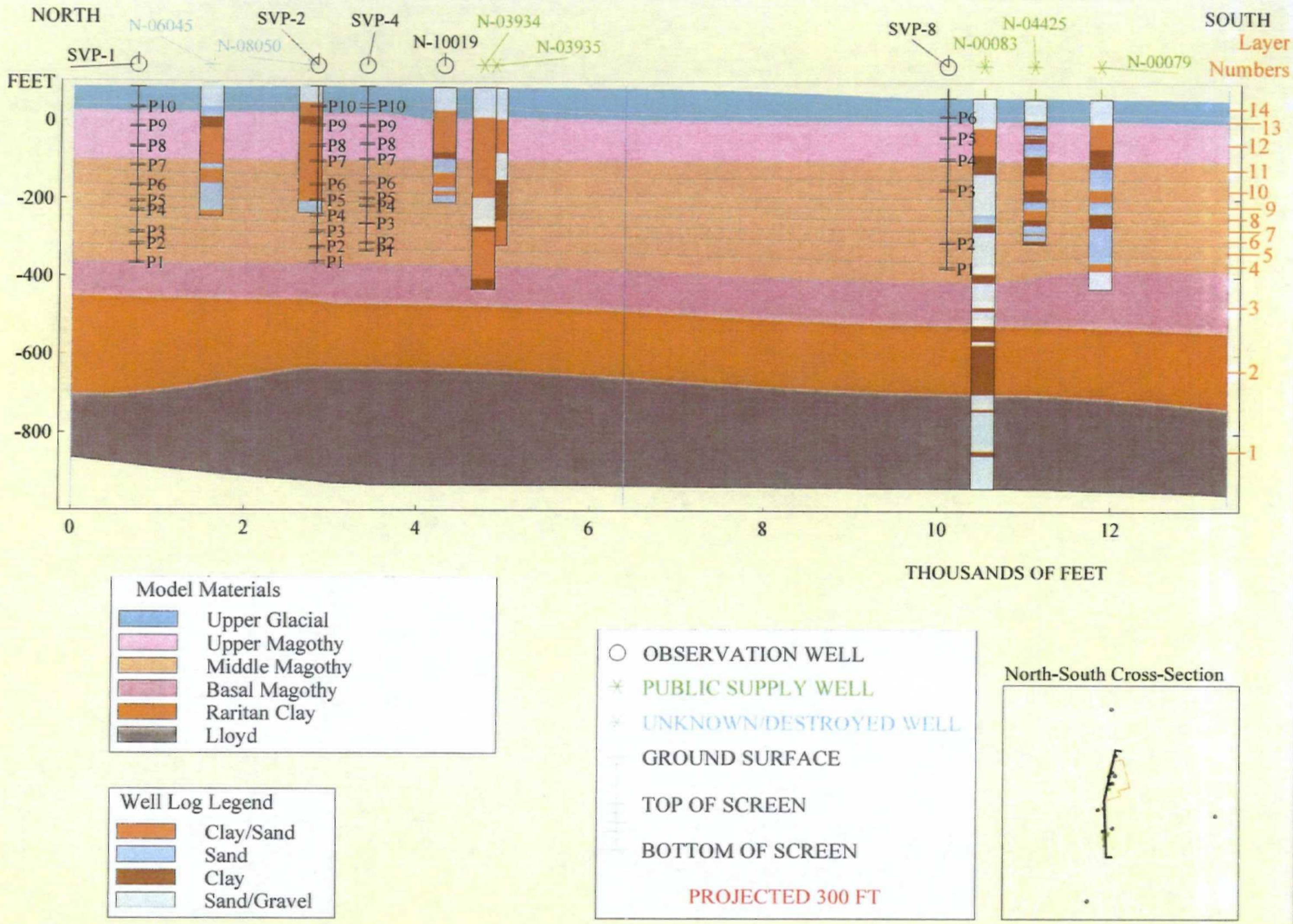
Figures List



CDM

Well Locations
Old Roosevelt Field, Garden City, NY
Draft Groundwater Model Results

FIGURE
1



CDM

North-South Site Cross-Section
Old Roosevelt Field, Garden City, NY
Draft Groundwater Model Results

FIGURE
2

Figure 3
Simulated and Observed Water Levels at Multi-port Wells

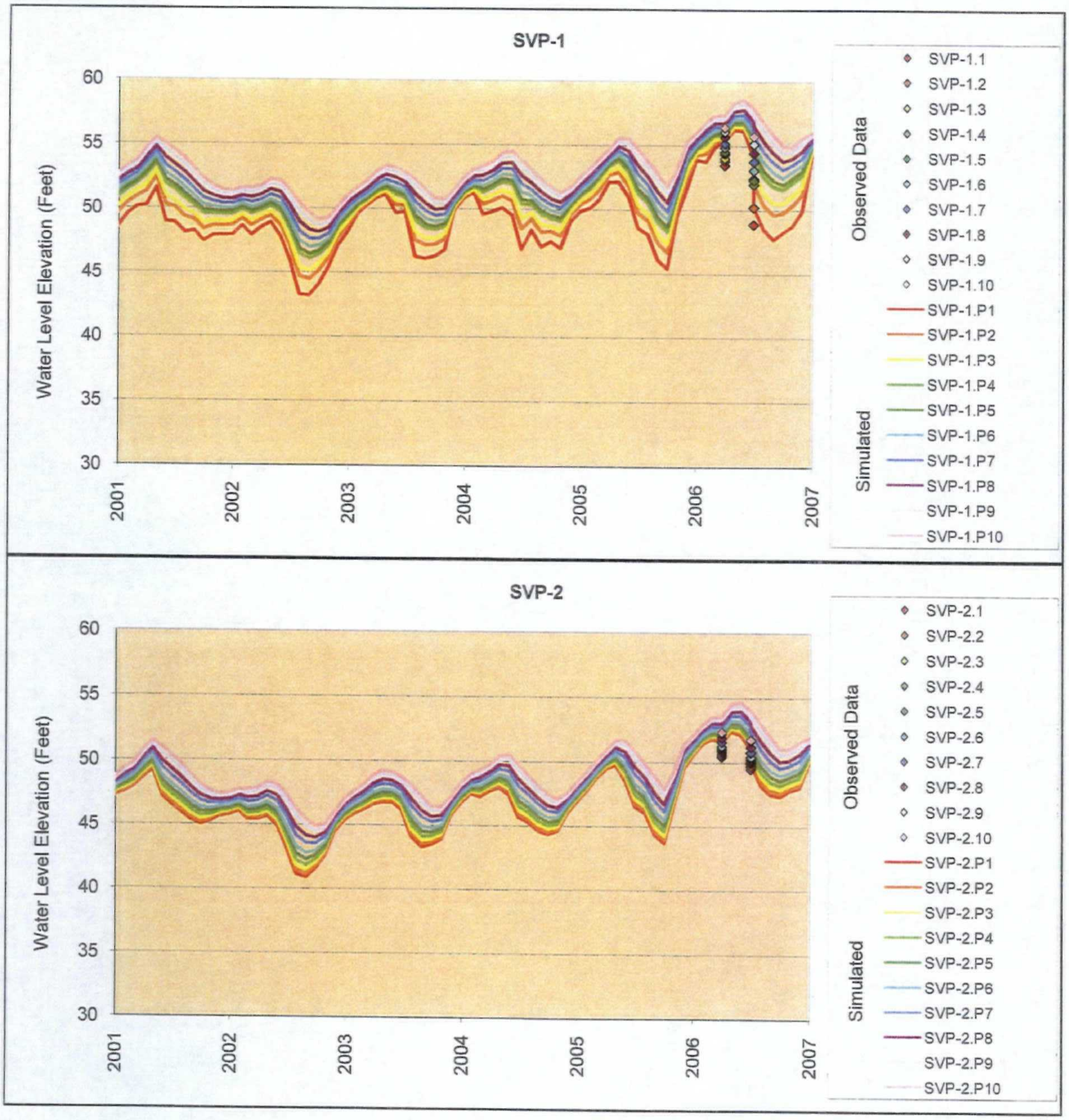
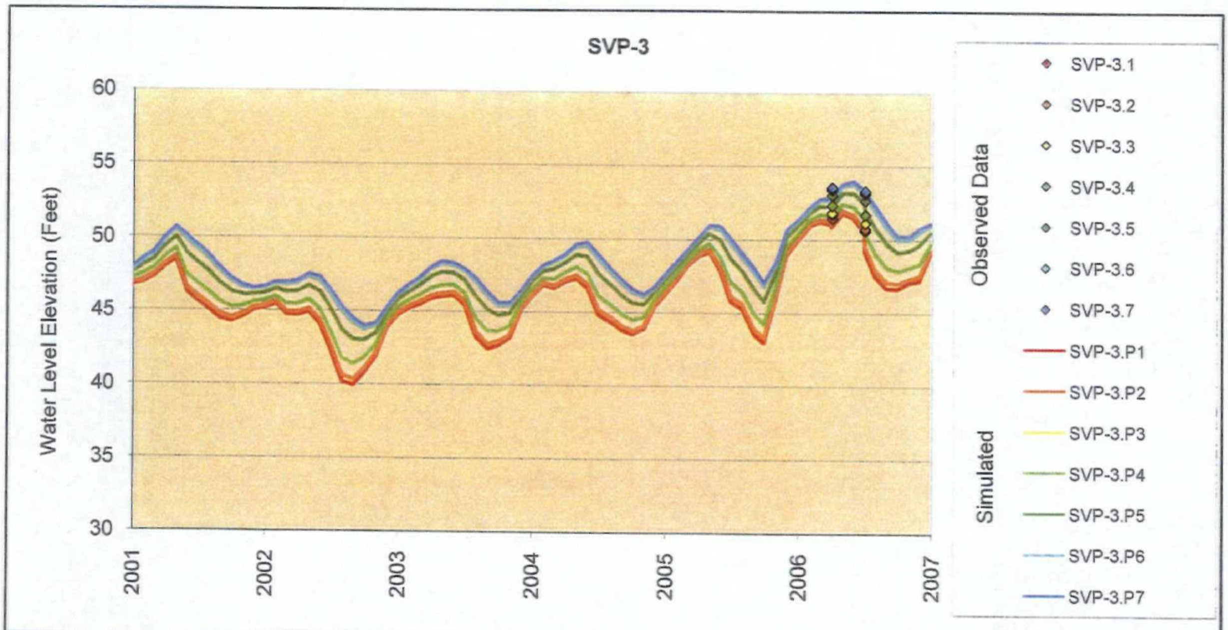


Figure 4
Simulated and Observed Water Levels at Multi-port Wells



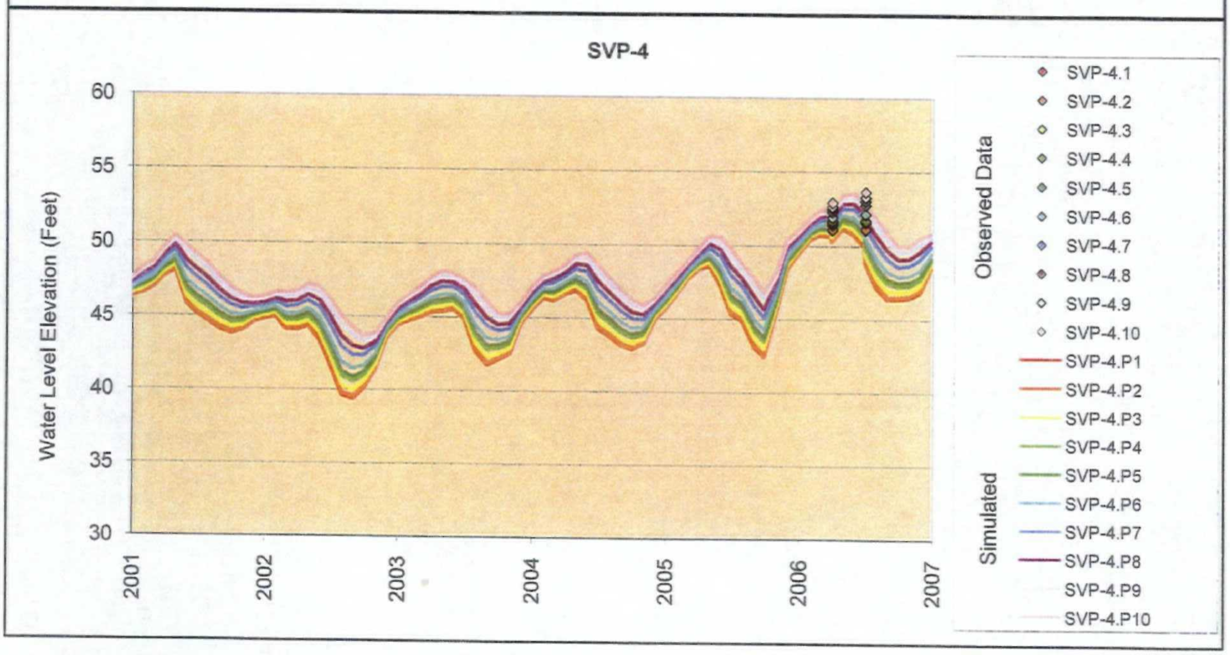


Figure 5
Simulated and Observed Water Levels at Multi-port Wells

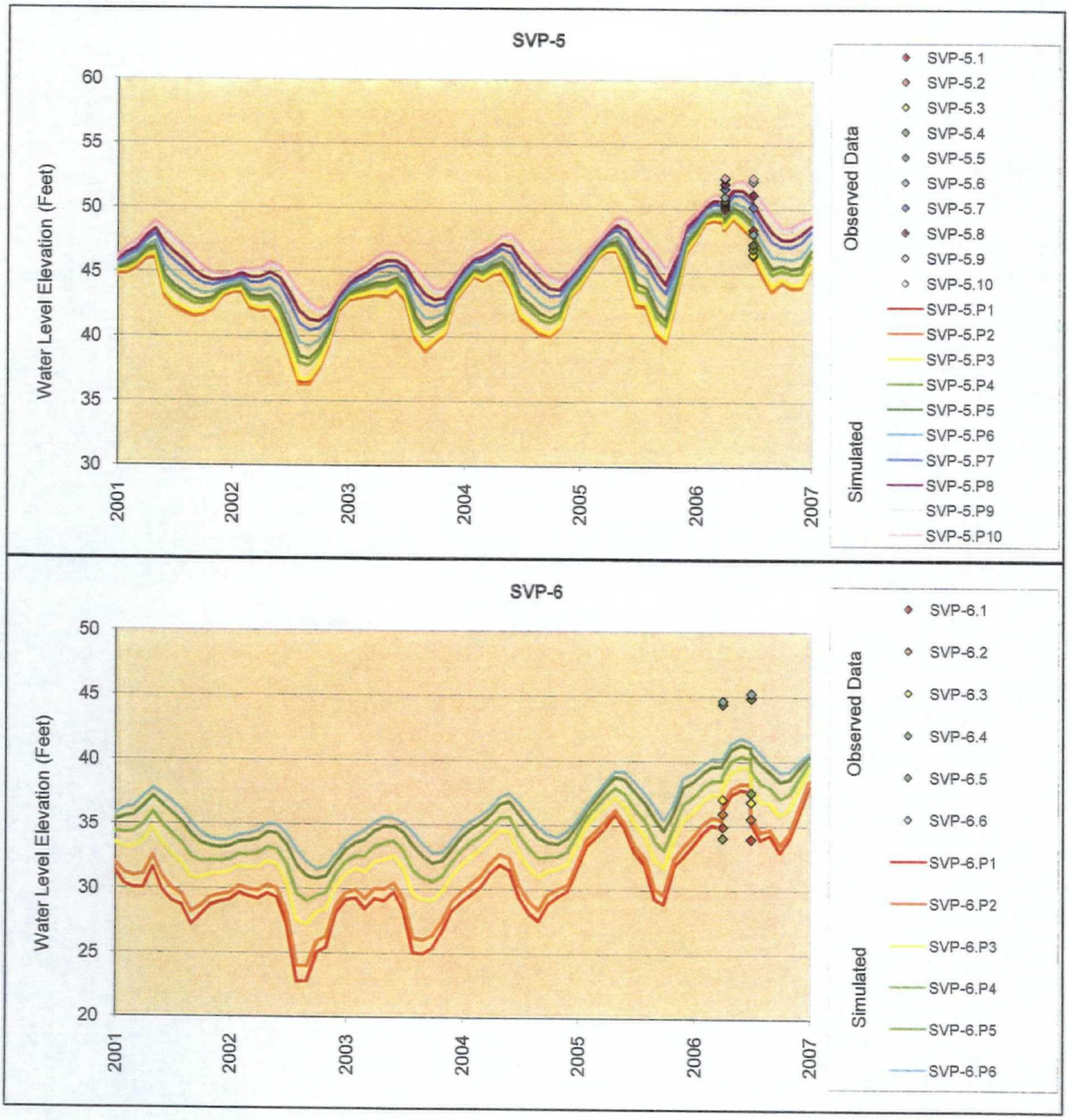
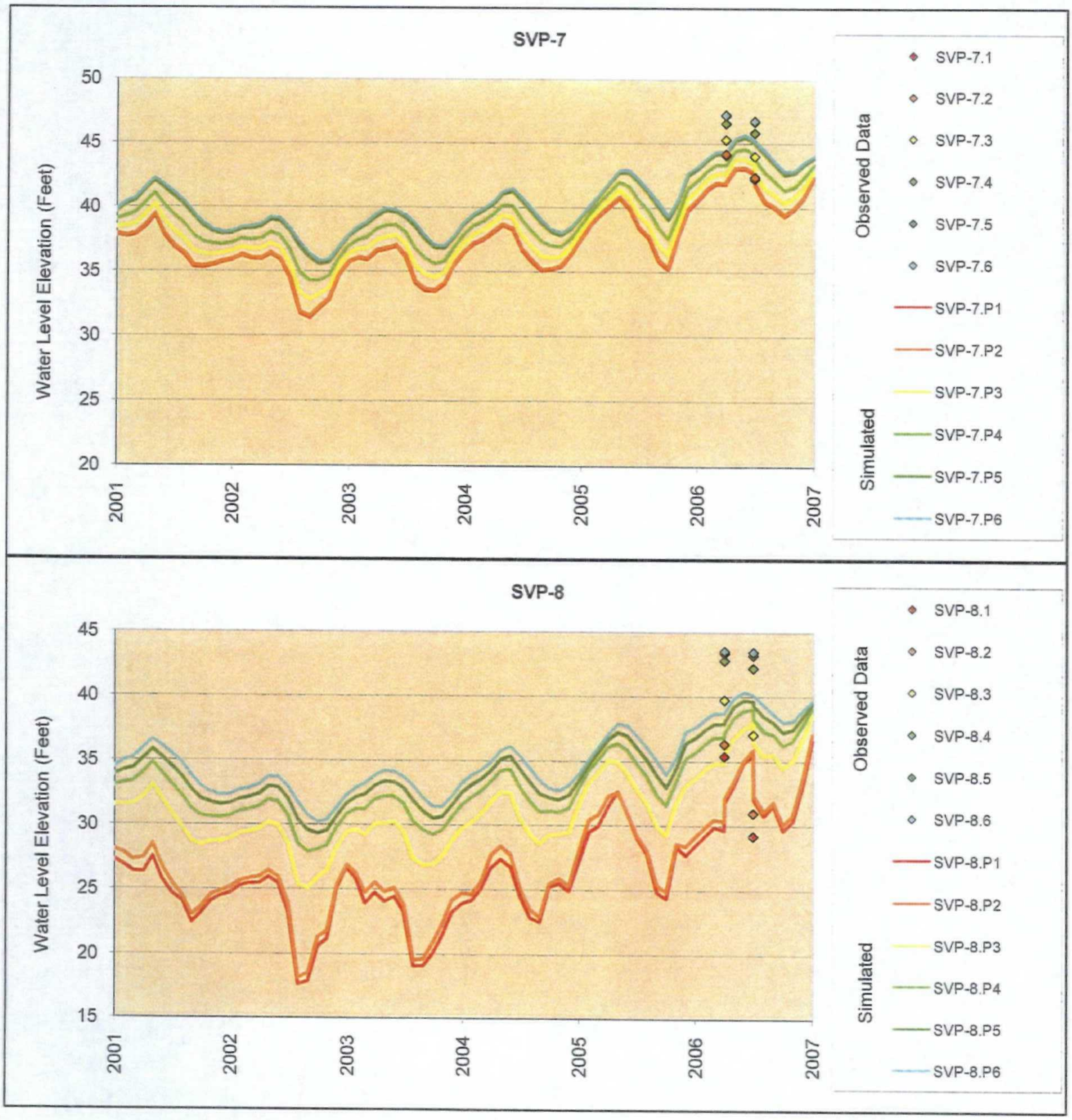
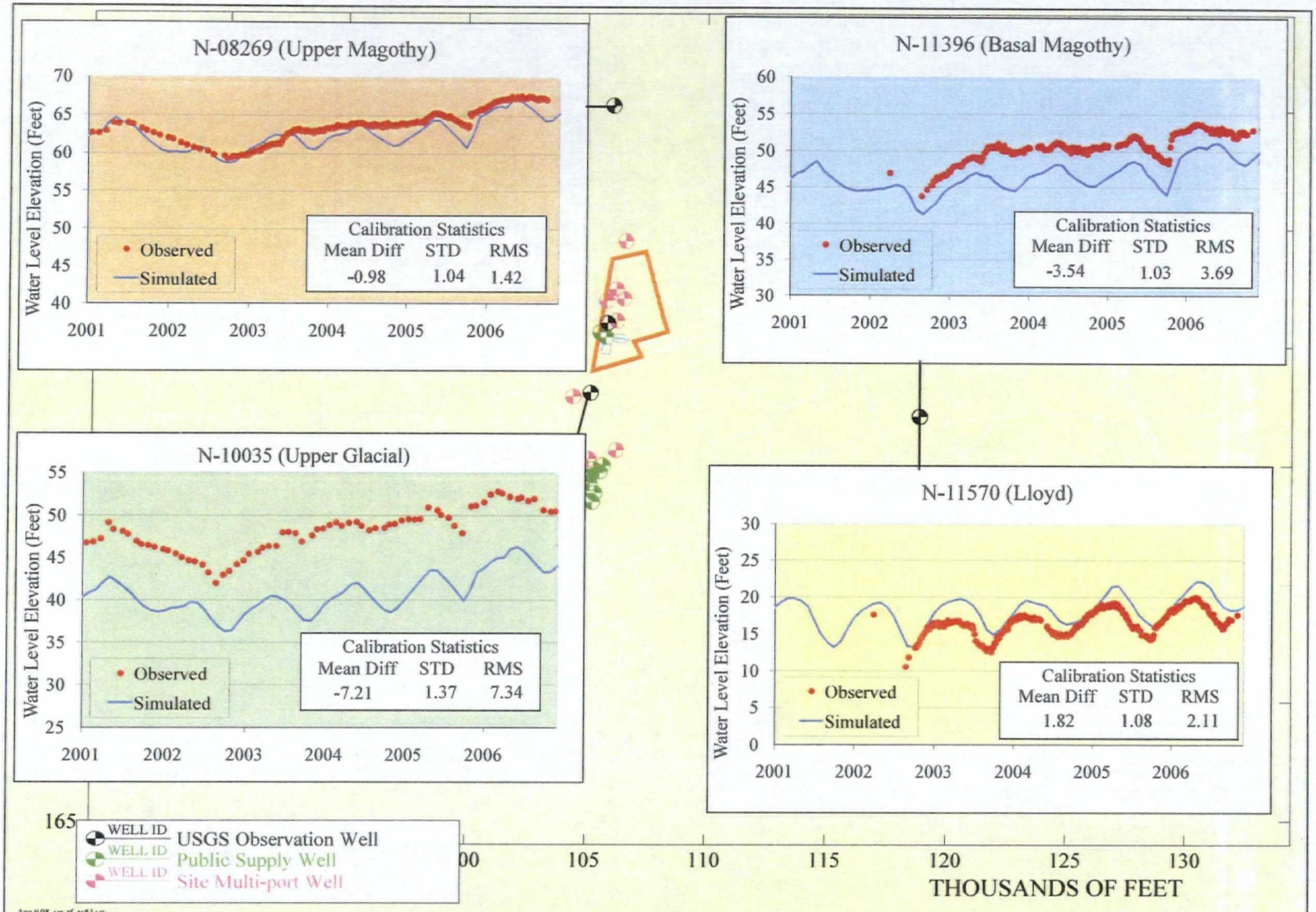


Figure 6
Simulated and Observed Water Levels at Multi-port Wells

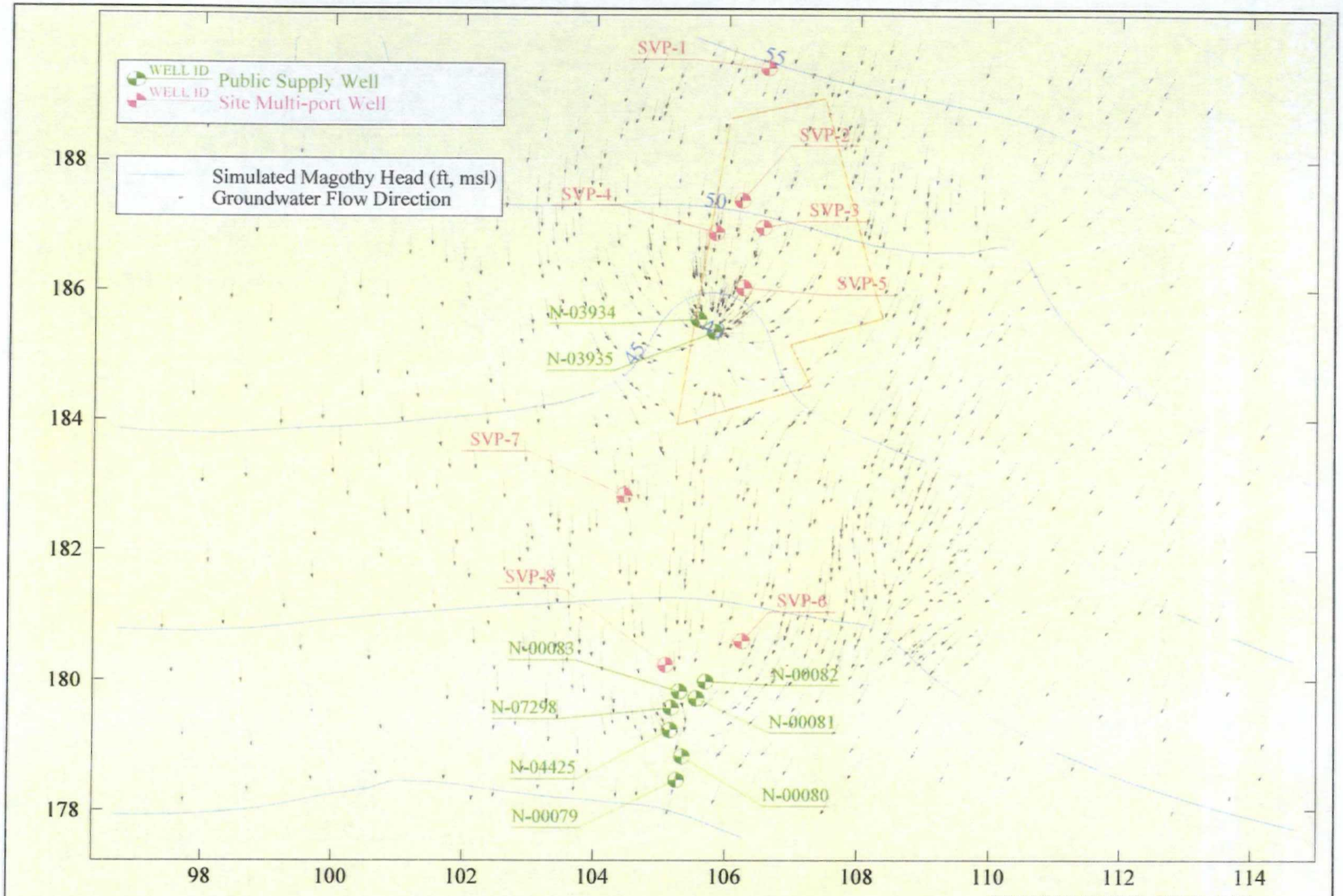




CDM

Simulated and Observed Water Levels at USGS Observation Wells
Old Roosevelt Field, Garden City, NY
Draft Groundwater Model Results

FIGURE 7



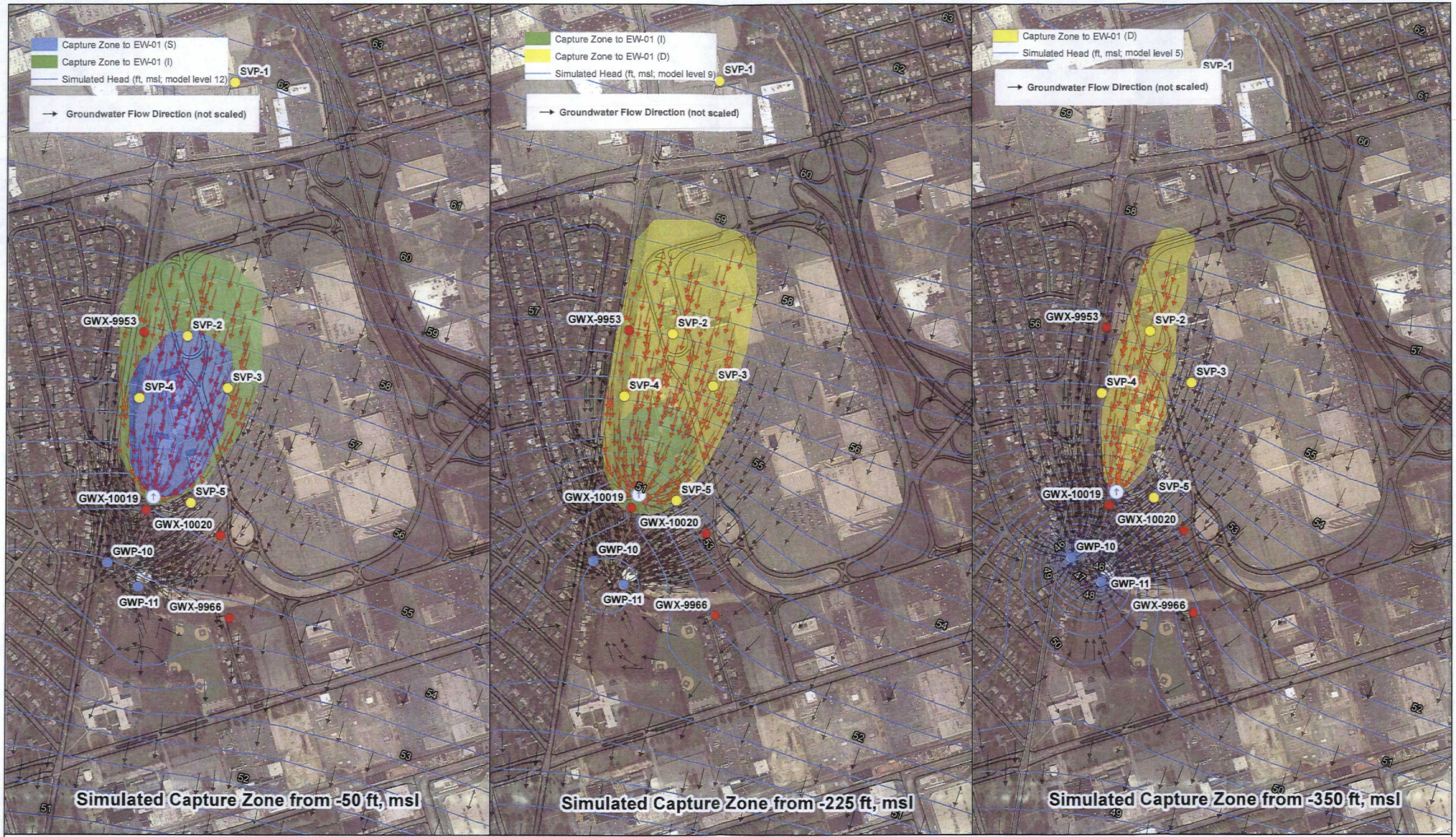
Note: Head contours and flow directions shown for model layer 8, approximately 320 ft bgs.

CDM

Middle Magothy Head Contours and Flow Directions
December 2006
Old Roosevelt Field, Garden City, NY
Draft Groundwater Model Results

FIGURE
8

Figure 9
Location of Proposed Extraction Wells (EW-01)
Old Roosevelt Field Contaminated Groundwater Site
Garden City, New York
CDM



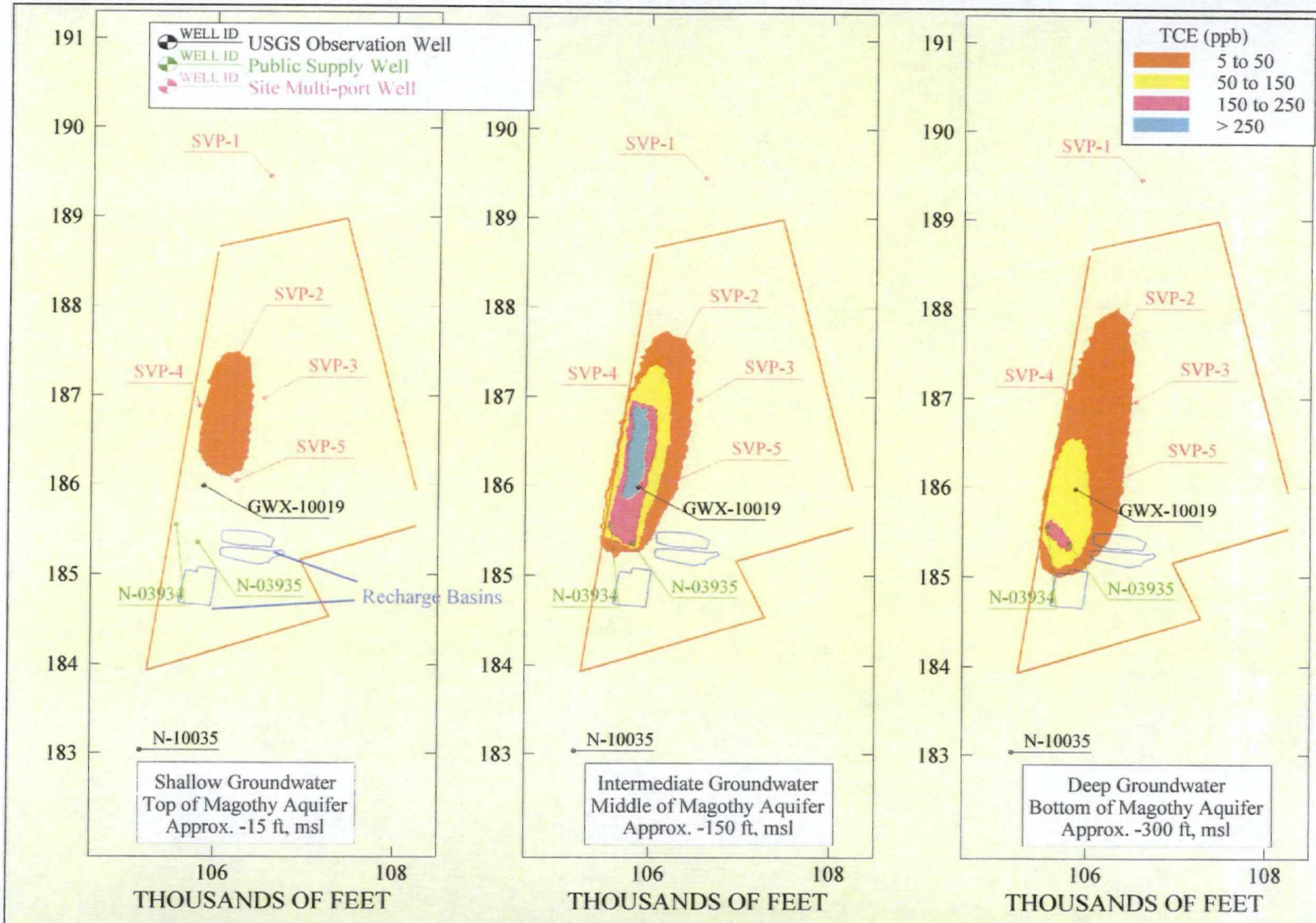
Extraction Well (EW-01)	EW-01 Pumping 200 gpm
Public Supply Well	Extraction Wells Screened:
Monitoring Well	-125 to -185 ft, msl -195 to -255 ft, msl
OtherMWs	-265 to -325 ft, msl

N

0 375 750 1,500 2,250 3,000 Feet

Figure 10
Simulated 15-Year Capture Zones to Recovery Well Cluster (EW-01)
Old Roosevelt Field Contaminated Groundwater Site
Nassau County, New York

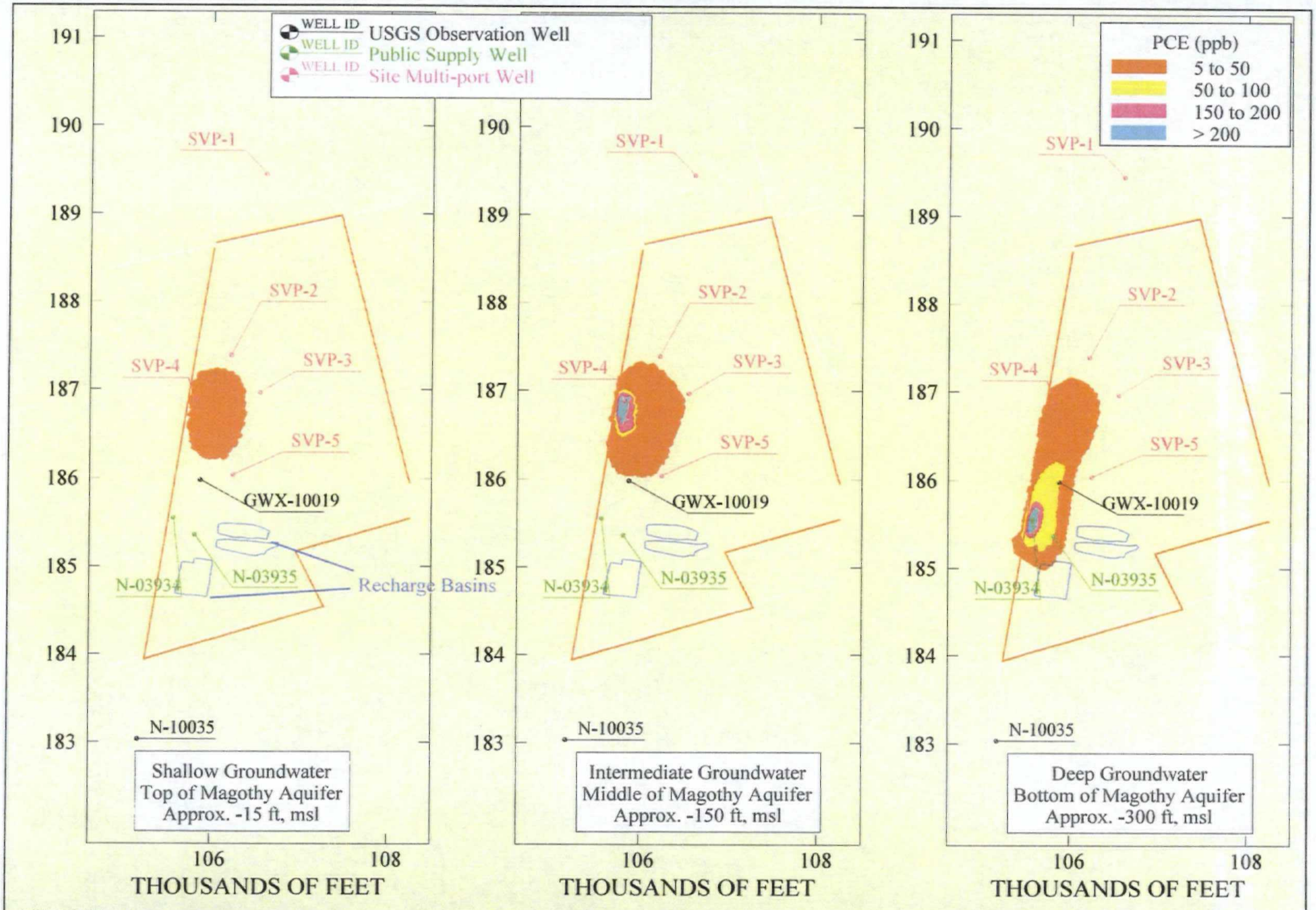
CDM



CDM

Simulated TCE Plume - Initial (Existing) Conditions
Old Roosevelt Field, Garden City, NY
Draft Groundwater Model Results

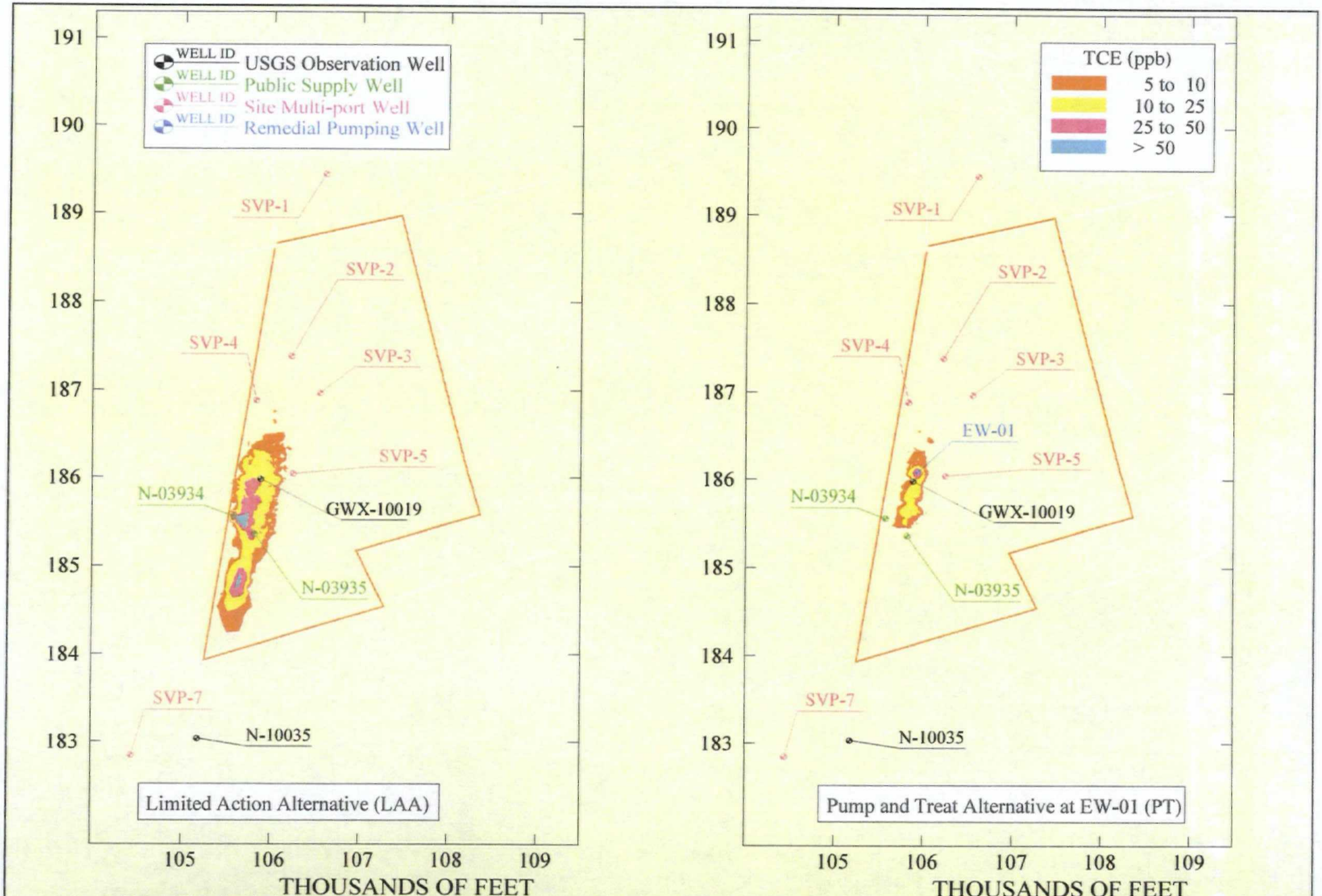
FIGURE
11



CDM

Simulated PCE Plume - Initial (Existing) Conditions
Old Roosevelt Field, Garden City, NY
Draft Groundwater Model Results

FIGURE
12



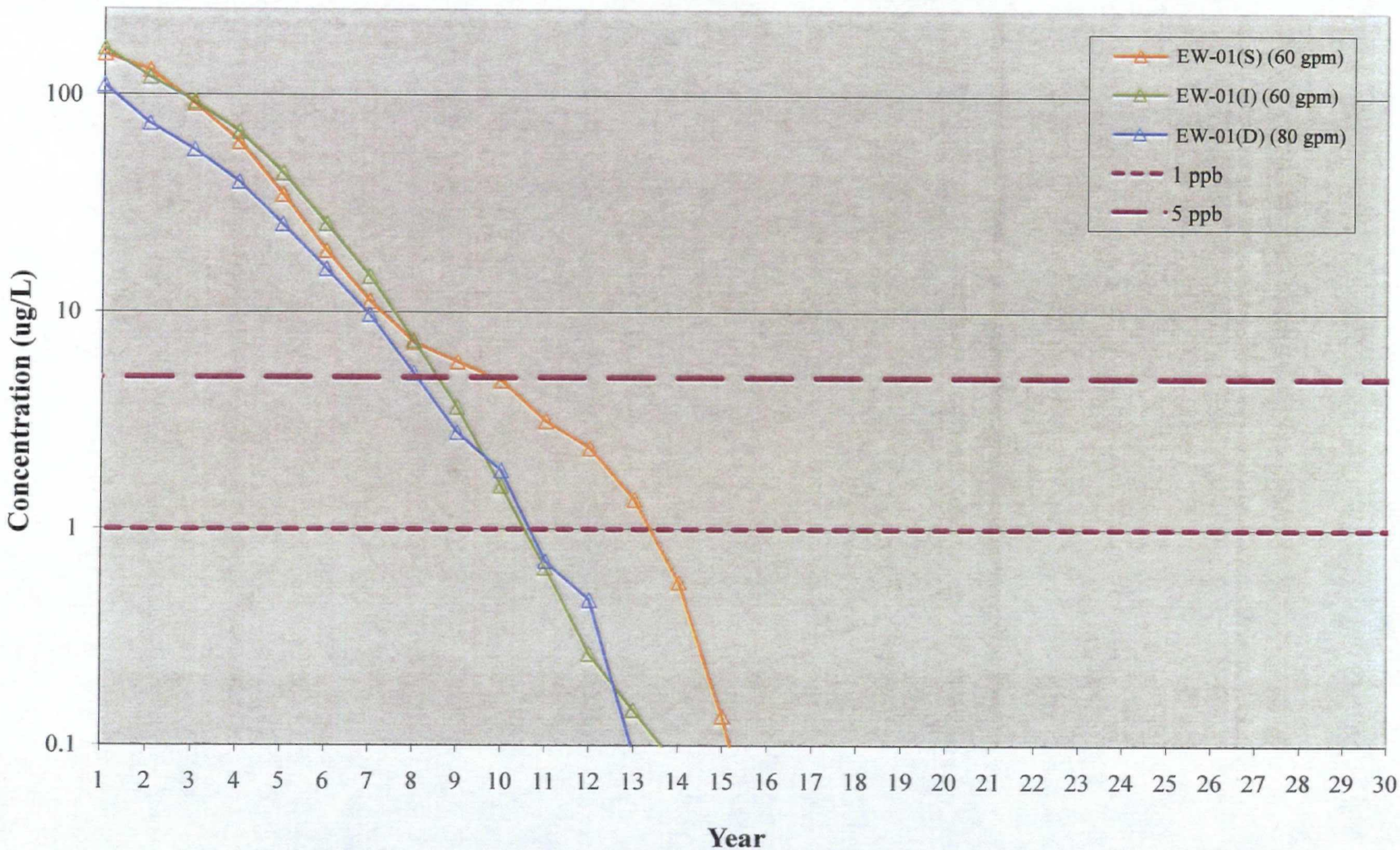
Note: The simulations assumed no continueing source of TCE.

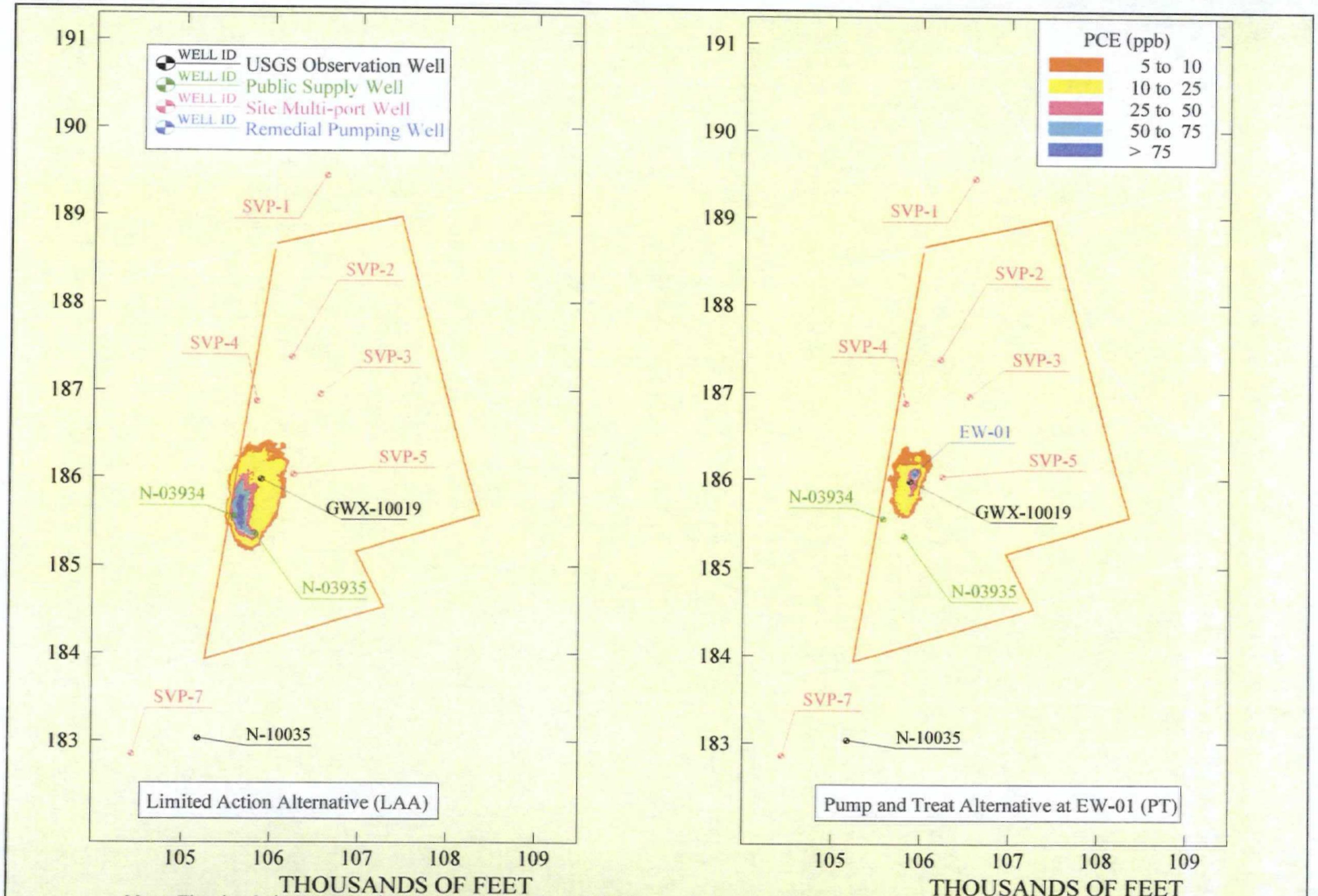
CDM

TCE Plume at 10 Years - LAA and PT
Old Roosevelt Field, Garden City, NY
Draft Groundwater Model Results

FIGURE 13

Figure 14
Average Annual Simulated TCE Concentrations
EW-01





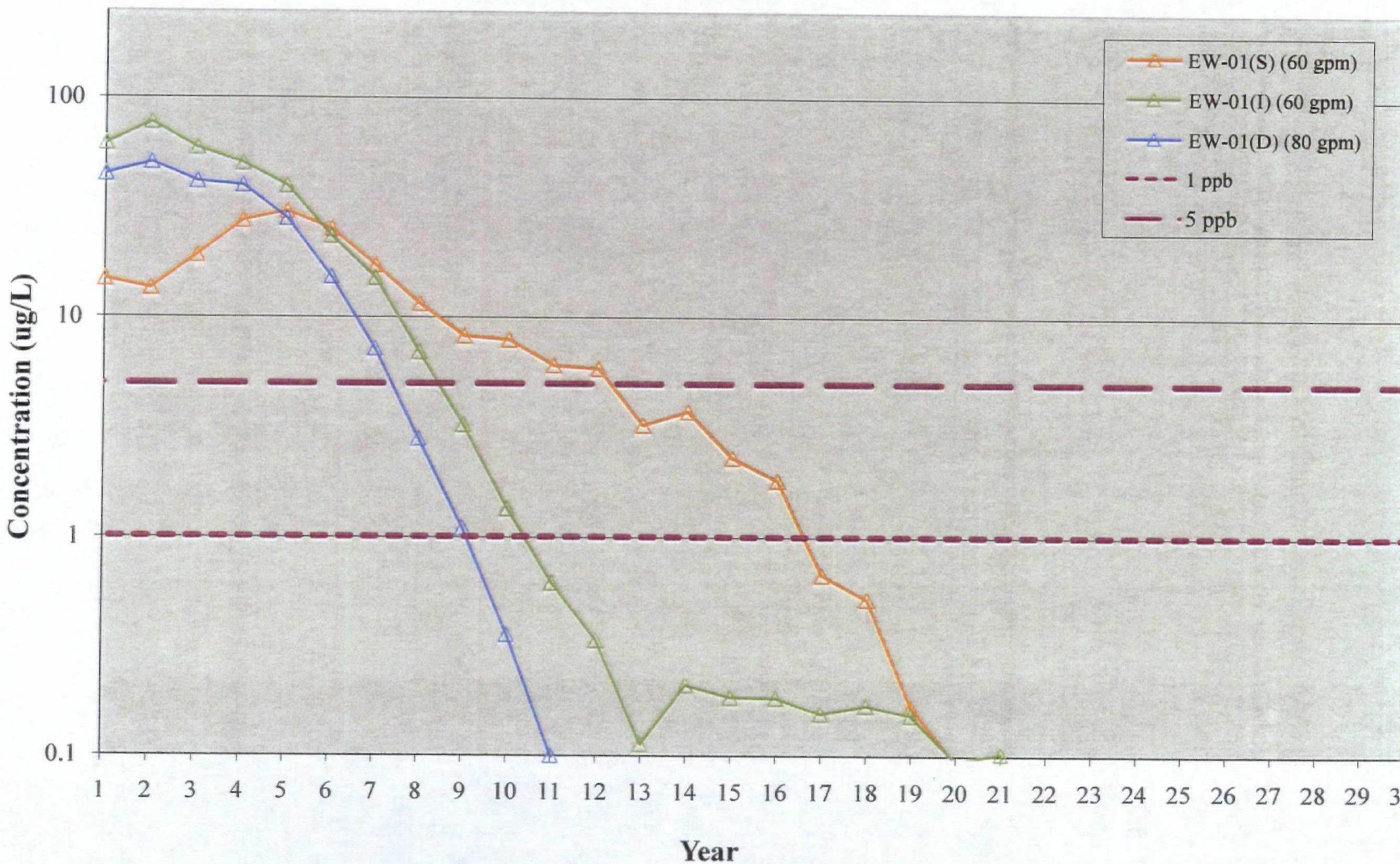
Note: The simulations assumed no continueing source of PCE.

CDM

PCE Plume at 10 Years - LAA and PT
Old Roosevelt Field, Garden City, NY
Draft Groundwater Model Results

FIGURE
15

Figure 16
Average Annual Simulated PCE Concentrations
EW-01



Appendix B

Appendix B

Influent Concentration Calculations

Appendix B
Influent Concentration Calculation

This appendix presents the calculation of the treatment system influent water quality including associated rationale and assumptions. The calculation is based on the RI and Pre-design investigation analytical results of those monitoring wells located within the 15-year contributing area of the three new groundwater extraction wells (i.e., EW-1S, EW-1I, and EW-1D).

As discussed in Section 2.0, a numerical groundwater model has been developed to simulate the capture zone of groundwater extraction wells and to provide the required influent flow rate for the treatment system. The goal of the groundwater extraction wells is to capture the 100 μg/L contaminant plume with minimum impact to the operation of Garden City Wells. The locations of these extraction wells are selected such that the future use of the Nassau County property Block 77 Lot 6A will not be affected. Based on the groundwater modeling results which are presented in Appendix A, the goal would be achieved with groundwater extraction between 125 and 325 feet below MSL at 200 gallon per minutes. To account for subsurface heterogeneity and to minimize the potential of creating preferential pathways in the vicinity of the pump intake, the screen interval is limited to 60 feet. Therefore, EW-1S, EW-1I, and EW-1D will be screened from 125 to 185 feet below MSL, 195 to 255 feet below MSL, and 265 to 325 feet below MSL, respectively. The pumping rate of EW-1S, EW-1I, and EW-1D will be 60, 60, and 80 gpm, respectively.

Figures B-1 through B-4 illustrates the simulated 15-year contributing areas to EW-1S, EW-1I, EW-1D, and the two Garden City water supply wells, at 150, 225, 295, and 350 feet below MSL, respectively. Simulation was also completed for shallower depth (i.e., 50 feet below MSL) but the result is not presented here, due to the findings that a significant portion of the groundwater at that elevation likely will not be captured by any of the three new groundwater extraction wells, as predicted by the computer model.

In order to calculate the influent concentrations, the groundwater elevation was divided into the following six depth intervals:

- above 100 feet below MSL;
- 100 to 187.5 feet below MSL (assumed to be represented by 150 feet below MSL-based simulation);
- 187.5 to 260 feet below MSL (assumed to be represented by 225 feet below MSL-based simulation);
- 260 to 322.5 feet below MSL(assumed to be represented by 295 feet below MSL-based simulation);

- 322.5 to 377.5 feet below MSL (assumed to be represented by 350 feet below MSL-based simulation); and
- below 377.5 feet below MSL.

In addition, it is also assumed that only groundwater from the middle four depth intervals above are contributing to the influent water quality. The list of monitoring wells potentially located within the 15-year contributing area of extractions wells EW-1S/1I/1D at different elevations is summarized in Table B-1. Except for GWX-10019, the rest of the monitoring wells are all multi-port wells. Table B-2 shows the specific sample locations whose results have been used to estimate the water quality for EW-1S/1I/1D. Detailed elevation data of these monitoring wells are presented in Table B-3.

Tables B-4 through B-6 present the VOC analytical results of all of the sample locations as identified in Table B-2, during the two rounds of RI sampling and one round of pre-design investigation sampling, for EW-1S, EW-1I, and EW-1D, respectively. The maximum VOC results among the three sampling rounds at each of these sample locations were then averaged to yield the estimated VOC concentrations in EW-1S/1I/1D. Note that in cases where individual VOC was detected only once at a sample location during the three rounds, the detection was used as the maximum; while in other cases where individual VOC was not detected in any of the three rounds of RI sampling, the maximum VOC was calculated as the half of the lowest reporting limits of these three rounds. Similarly, the estimated iron and manganese concentrations were calculated for EW-1S, EW-1I, and EW-1D, and the detailed results are presented in Tables B-7 through B-9.

The estimated VOC and iron/manganese concentrations for EW-1S, EW-1I, and EW-1D are summarized in Table B-10, which also contains the average weighted concentrations (weighted by design flow rate of EW-1S, EW-1I, and EW-1D: 60 gpm, 60 gpm, and 80 gpm, respectively). These average weighted concentrations were generally used as the influent concentrations except for TCE and PCE. Modeling was completed specifically with respect to these two constituents, and the yielded influent concentrations are 28.8% and 66.5% higher the average weighted concentrations for TCE and PCE, respectively. To be conservative, the modeling results for TCE and PCE were used as the estimated influent concentrations.

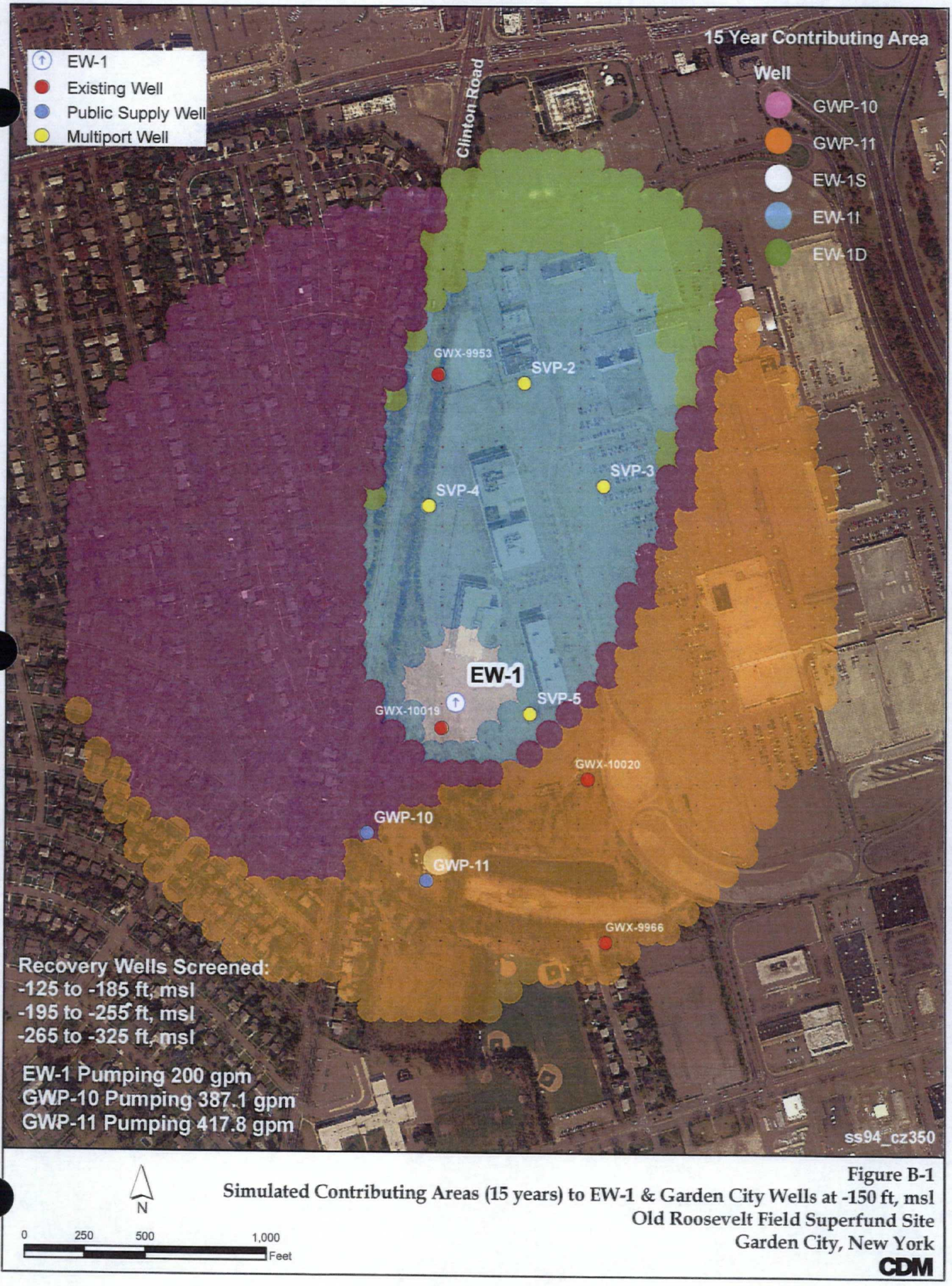


Figure B-1
Simulated Contributing Areas (15 years) to EW-1 & Garden City Wells at -150 ft, msl
Old Roosevelt Field Superfund Site
Garden City, New York
CDM

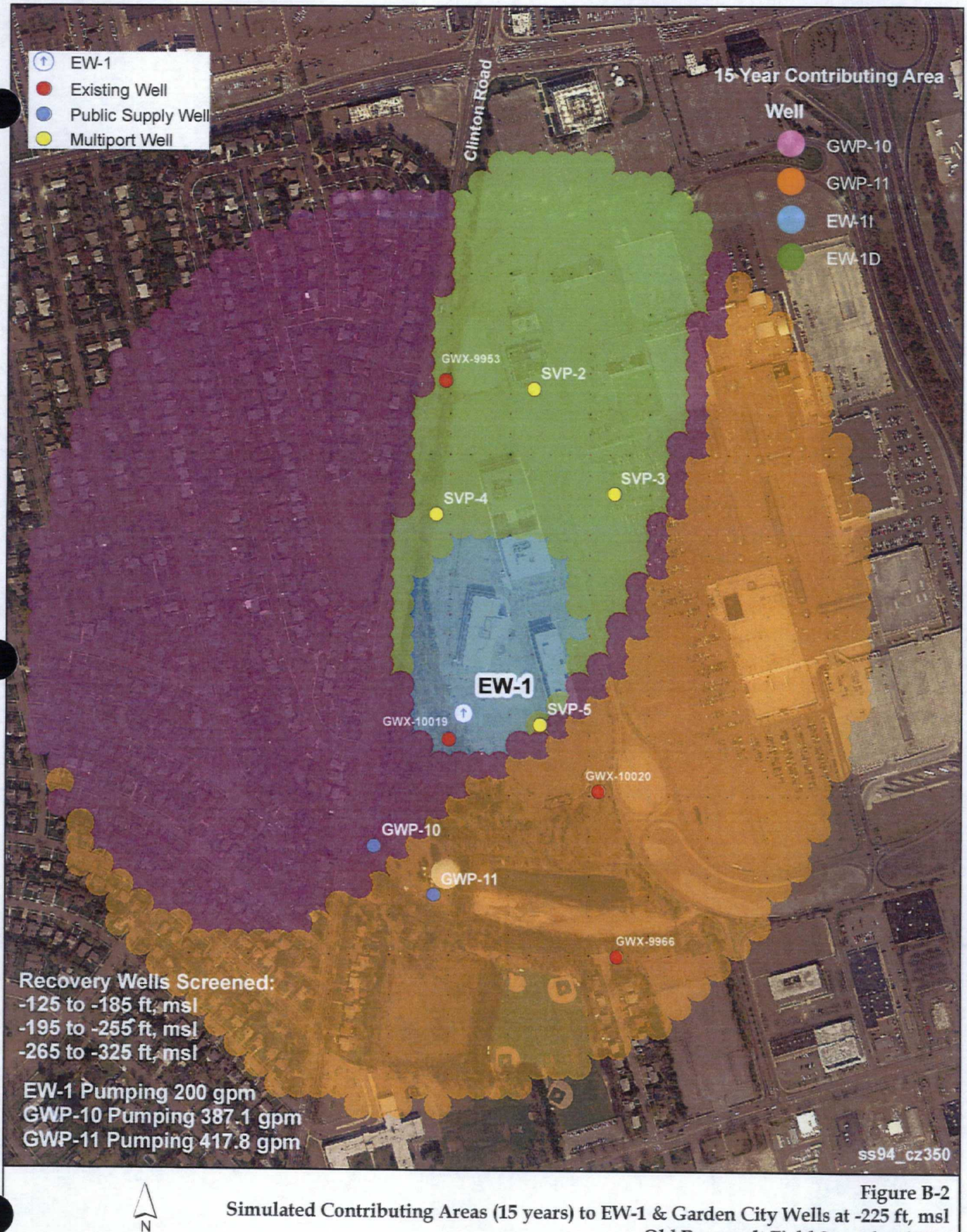


Figure B-2
Simulated Contributing Areas (15 years) to EW-1 & Garden City Wells at -225 ft, msl
Old Roosevelt Field Superfund Site
Garden City, New York
CDM

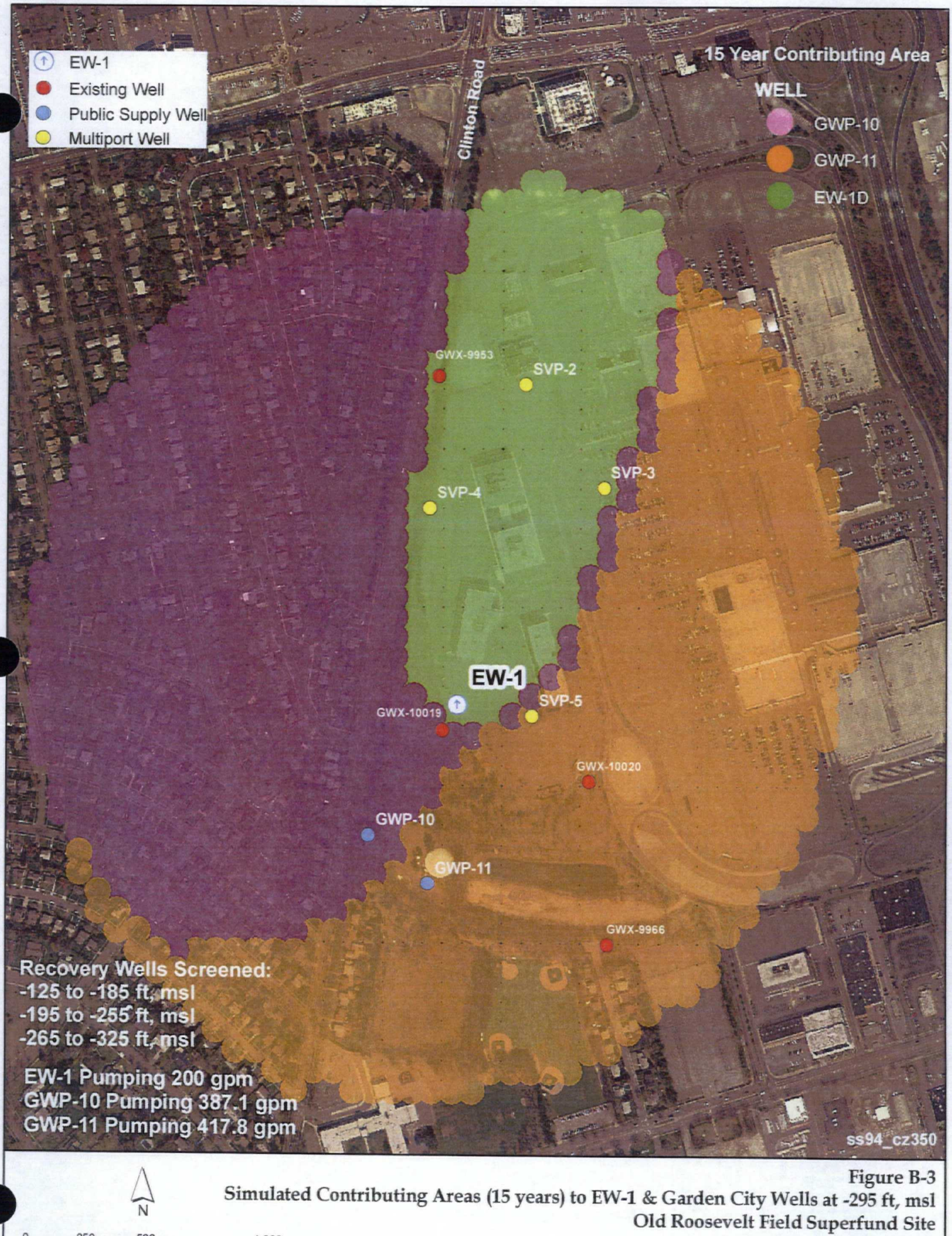


Figure B-3
Simulated Contributing Areas (15 years) to EW-1 & Garden City Wells at -295 ft, msl
Old Roosevelt Field Superfund Site
Garden City, New York
CDM

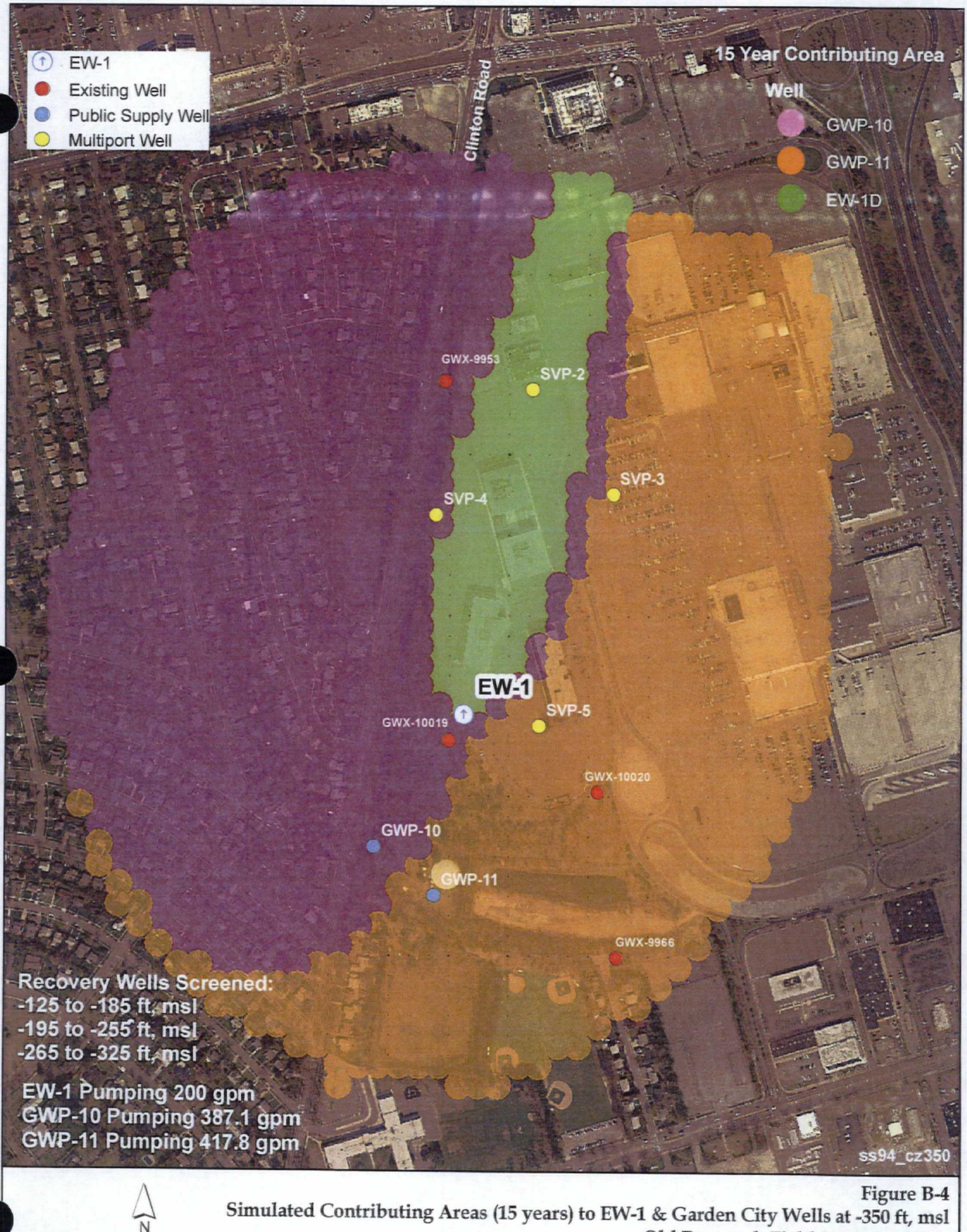


Figure B-4
Simulated Contributing Areas (15 years) to EW-1 & Garden City Wells at -350 ft, msl
Old Roosevelt Field Superfund Site
Garden City, New York
CDM

TABLE B-1
List of Monitoring Wells Potentially Located within 15-Year Contributing Area of Extraction Wells at Different Elevations
Design Analysis Report
Old Roosevelt Field Superfund Site
Garden City, New York

Elevation Range (msl)	SVP-2	SVP-3	SVP-4	SVP-5	GWX-10019	SVP/GWM-10
Above -100	N/A*	EW-1I	N/A*	N/A	N/A	N/A
-100 to -187.5	EW-1I	EW-1I	EW-1I	EW-1I	EW-1S	EW-1S
-187.5 to -260	EW-1D	EW-1D	EW-1D	EW-1D	N/A	EW-1I
-260 to -322.5	EW-1D	EW-1D	EW-1D	N/A	N/A	EW-1D
-322.5 to -375	EW-1D	N/A	N/A	N/A	N/A	EW-1D
Less than -375	N/A	N/A	N/A	N/A	N/A	N/A

* - Even though Port 8 of SVP-2, SVP-4, and SVP/GWM-10 are within the elevation interval -50 to -100 ft msl, model simulation results indicate a significant portion of the water within that elevation interval likely will not be captured by EW-1S.

TABLE B-2
List of Extraction Wells with Sample Locations used to Calculate the Contaminant Concentrations
Design Analysis Report
Old Roosevelt Field Superfund Site
Garden City, New York

Well	SVP-2	SVP-3	SVP-4	SVP-5	GWX-10019	SVP/GWM-10
EW-1S	N/A*	N/A	NA*	N/A	Yes	Port 6, Port 7
EW-1I	Port 6, Port 7	N/A	Port 6, Port 7	Port 6, Port 7	N/A	Port 4, Port 5
EW-1D	Port 1 through Port 5	Port 2 through Port 4	Port 2 through Port 5	Port 3 through Port 5	N/A	Port 2, Port 3

* - Even though Port 8 of SVP-2, SVP-4 and SVP/GWM-10 are within the elevation interval -50 to -100 ft msl, model simulation results indicate a significant portion of the water within that elevation interval likely will not be captured by EW-1S.
N/A: not applicable

TABLE B-3
Elevation Data of Multi-port Minitoring Wells and GWX-10019 Potentially Located within 15-Year Contributing Area of Extraction Wells
Design Analysis Report
Old Roosevelt Field Superfund Site
Garden City, New York

Well ID	Port	Ground Surface Elevation (feet amsl)	Measurement Port Depth (feet BTOC)	Port Elevation (feet amsl)
SVP-2	1	89.39	455	-365.6
	2	89.39	418	-328.6
	3	89.39	378	-288.6
	4	89.39	338	-248.6
	5	89.39	298	-208.6
	6	89.39	258	-168.6
	7	89.39	198	-108.6
	8	89.39	158	-68.6
	9	89.39	108	-18.6
	10	89.39	58	31.4
SVP-3	1	87.17	455	-367.8
	2	87.17	398	-310.8
	3	87.17	378	-290.8
	4	87.17	298	-210.8
	5	87.17	178	-90.8
	6	87.17	108	-20.8
	7	87.17	58	29.2
SVP-4	1	88.85	425	-336.2
	2	88.85	405	-316.2
	3	88.85	358	-269.2
	4	88.85	313	-224.2
	5	88.85	293	-204.2
	6	88.85	253	-164.2
	7	88.85	193	-104.2
	8	88.85	153	-64.2
	9	88.85	108	-19.2
	10	88.85	53	35.9
SVP-5	1	85.55	435	-349.5
	2	85.55	413	-327.5
	3	85.55	363	-277.5
	4	85.55	318	-232.5
	5	85.55	298	-212.5
	6	85.55	258	-172.5
	7	85.55	198	-112.5
	8	85.55	158	-72.5
	9	85.55	103	-17.5
	10	85.55	53	32.6
GWX-10019	-	85.19	223 to 228	-142.81 to -137.81
SVP/GWM-10	1	87.83	482	-394.2
	2	87.83	402	-314.2
	3	87.83	352	-264.2
	4	87.83	307	-219.2
	5	87.83	287	-199.2
	6	87.83	247	-159.2
	7	87.83	187	-99.2
	8	87.83	147	-59.2
	9	87.83	102	-14.2
	10	87.83	47	40.8

Table B-4
Estimated VOC Concentrations in EW-1S
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Method	Sample Code Sample Name Sample Date Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWX-10019-R1 3/22/2006 223 to 228 ft bgs			GWX-10019-R2 7/11/2006 223 to 228 ft bgs			GWX-10019-R3 10/20/2008 223 to 228 ft		GWX-10019 Max	GWM-10-6-R3 10/22/2008 245 to 250 ft		GWM-10-6 Max	GWM-10-7-R3 10/22/2008 185 to 190 ft	
(Group Description)																	
LDL-Volatile Organic Compounds																	
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	0.62		#	0.75	U		0.5	U	0.62	0.5	U	0.25	0.5	U
Chloromethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U	0.25	0.5	U
Trichlorofluoromethane	OLC02-1-V	µg/L	5	1.5		#	1.9		#	0.5	UJ	1.9	0.19	J	0.19	0.5	U
1,1-Dichloroethene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U	0.25	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	UJ	0.25	0.5	U	0.25	0.5	U
Methylene Chloride	OLC02-1-V	µg/L	5	0.1	J	#	0.84	U		0.5	UJ	0.1	0.5	U	0.25	0.5	U
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.3	J	#	0.24	J	#	0.5	U	0.3	0.5	U	0.25	0.18	J
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	17		A	24		A	0.54	J	24	0.5	U	0.25	1.2	
1,1-Dichloroethane	OLC02-1-V	µg/L	5	0.18	J	#	0.22	J	#	0.5	U	0.22	0.5	U	0.25	0.83	
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	21		A	23		A	5.1		23	2.3		2.3	11	
2-Butanone	OLC02-1-V	µg/L	50	5	U		5	U		5	UJ	2.5	5	U	2.5	5	U
Chloroform	OLC02-1-V	µg/L	7	0.29	J	#	0.5	U		0.5	U	0.29	0.5	U	0.25	0.5	U
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	UJ	0.25	0.5	U	0.25	0.13	J
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.2	J	#	0.28	J	#	0.5	UJ	0.28	0.5	U	0.25	0.14	J
Benzene	OLC02-1-V	µg/L	1	0.5	U		0.5	U		0.5	U	0.25	0.5	U	0.25	0.5	U
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	1.3		A	0.5	U		0.5	UJ	1.3	0.5	U	0.25	0.5	U
Trichloroethene	OLC02-1-V	µg/L	5	260		A	170		A	5.5		260	5.5		5.5	67	
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.11	J	#	0.5	U		0.5	U	0.11	0.5	U	0.25	0.5	U
Toluene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.16	J	0.25	0.5	U	0.25	0.5	U
Tetrachloroethene	OLC02-1-V	µg/L	5	2		#	2.2		#	0.5	U	2.2	0.5	U	0.25	1.7	
Dibromochloromethane	OLC02-1-V	µg/L	50	0.5	U		0.5	U		0.5	U	0.25	0.5	U	0.25	0.5	U
Ethylbenzene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U	0.25	0.5	U
Xylenes (total)	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U	0.25	0.5	U
Bromoform	OLC02-1-V	µg/L	50	0.5	U		0.5	R		0.5	U	0.25	0.5	U	0.25	0.5	U
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.5	U		0.5	R		0.5	U	0.25	0.5	U	0.25	0.5	U
												Average			Average		
pH				6.35			5.81			8.95		7.04	7.27		7.27	6.23	

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-4
Estimated VOC Concentrations in EW-1S
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Metho	Sample Code Sample Name Sample Date Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-10-7 Max	RW-1S Influent
(Group Description)					
LDL-Volatile Organic Compounds					
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	0.25	0.4
Chloromethane	OLC02-1-V	µg/L	5	0.25	0.3
Trichlorofluoromethane	OLC02-1-V	µg/L	5	0.25	0.8
1,1-Dichloroethene	OLC02-1-V	µg/L	5	0.25	0.3
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.25	0.3
Methylene Chloride	OLC02-1-V	µg/L	5	0.25	0.2
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.18	0.2
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	1.2	8.5
1,1-Dichloroethane	OLC02-1-V	µg/L	5	0.83	0.4
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	11	12.1
2-Butanone	OLC02-1-V	µg/L	50	2.5	2.5
Chloroform	OLC02-1-V	µg/L	7	0.25	0.3
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	0.13	0.2
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.14	0.2
Benzene	OLC02-1-V	µg/L	1	0.25	0.3
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.25	0.6
Trichloroethene	OLC02-1-V	µg/L	5	67	110.8
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.25	0.2
Toluene	OLC02-1-V	µg/L	5	0.25	0.3
Tetrachloroethene	OLC02-1-V	µg/L	5	1.7	1.4
Dibromochloromethane	OLC02-1-V	µg/L	50	0.25	0.3
Ethylbenzene	OLC02-1-V	µg/L	5	0.25	0.3
Xylenes (total)	OLC02-1-V	µg/L	5	0.25	0.3
Bromoform	OLC02-1-V	µg/L	50	0.25	0.3
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.25	0.3
				Average	
pH				6.23	6.85

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-5
Estimated VOC Concentrations in EW-1I
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Meth	Sample Code / Sample Nam / Sample Date / Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-02-6-R1 4/10/2006 250 to 255 ft bgs			GWM-02-6-R1-Dup GWM-20-6-R1 4/10/2006 250 to 255 ft bgs			GWM-02-6-R2 7/14/2006 250 to 255 ft bgs			GWM-02-6-R3 10/21/2008 250 to 255 ft		GWM-02-6 Max	GWM-02-7-R1 4/7/2006 190 to 195 ft bgs			GWM-02-7-R2 7/13/2006 190 to 195 ft bgs		
(Group Description)																					
LDL-Volatile Organic Compounds																					
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	2.9	J	#	6.9	J	A	0.5	U		1.2		6.9	7.5		A	0.5	U	
Chloromethane	OLC02-1-V	µg/L	5	1	U		1.6	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U	
Trichlorofluoromethane	OLC02-1-V	µg/L	5	0.36	J	#	0.81	J	#	0.5	U		0.28	J	0.81	0.55		#	0.5	U	
1,1-Dichloroethene	OLC02-1-V	µg/L	5	1	U		1.6	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U	
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	1	U		1.6	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U	
Methylene Chloride	OLC02-1-V	µg/L	5	1	U		1.6	U		0.93		#	0.5	U	0.93	0.5	U		0.61	U	
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.81	J	#	1	J	#	0.84		#	0.51		1	0.5	U		0.5	U	
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	0.82	J	#	0.73	J	#	1.1		#	0.51		1.1	0.44	J	#	0.72		#
1,1-Dichloroethane	OLC02-1-V	µg/L	5	0.24	J	#	0.36	J	#	0.33	J	#	0.21	J	0.36	0.5	U		0.5	U	
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	8.4		A	11		A	10		A	4.1		11	0.29	J	#	0.34	J	#
2-Butanone	OLC02-1-V	µg/L	50	10	U		16	U		60		A	5	U	60	5	U		68		A
Chloroform	OLC02-1-V	µg/L	7	1	U		1.6	U		0.5	U		0.5	U	0.25	0.34	J	#	0.5	U	
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	1	U		1.6	U		0.27	J	#	0.5	U	0.27	0.5	U		0.5	U	
Carbon Tetrachloride	OLC02-1-V	µg/L	5	1	U		1.6	U		0.13	J	#	0.5	U	0.13	0.16	J	#	0.1	J	#
Benzene	OLC02-1-V	µg/L	1	1	U		1.6	U		0.15	J	#	0.5	U	0.15	0.5	U		0.5	U	
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	1	U		1.6	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U	
Trichloroethene	OLC02-1-V	µg/L	5	25		A	37		A	17		A	31		37	18		A	12		A
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	1	U		1.6	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U	
Toluene	OLC02-1-V	µg/L	5	1	U		1.6	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U	
Tetrachloroethene	OLC02-1-V	µg/L	5	1.8		#	3.5		#	4.3		#	3.3		4.3	3.2		#	2.3		#
Dibromochloromethane	OLC02-1-V	µg/L	50	1	U		1.6	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U	
Ethylbenzene	OLC02-1-V	µg/L	5	1	U		1.6	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U	
Xylenes (total)	OLC02-1-V	µg/L	5	1	U		1.6	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U	
Bromoform	OLC02-1-V	µg/L	50	1	U		1.6	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U	
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	1	U		1.6	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U	
															Average						
pH				6.67						5.72			5.62		6.00	5.55			5.48		

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-5
Estimated VOC Concentrations in EW-1I
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Meth	Sample Code / Sample Name / Sample Date / Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-02-7-R3 10/21/2008 190 to 195 ft		GWM-02-7 Max	GWM-04-6-R1 4/11/2006 245 to 250 ft bgs			GWM-04-6-R2 7/17/2006 245 to 250 ft bgs			GWM-04-6-R3 10/20/2008 245 to 250 ft		GWM-04-6 Max	GWM-04-7-R1 4/11/2006 185 to 190 ft bgs		
(Group Description)																		
LDL-Volatile Organic Compounds																		
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	0.75		7.5	15	J	A	0.5	U		9		15	4.3	J	#
Chloromethane	OLC02-1-V	µg/L	5	0.5	U	0.25	13	U		0.5	U		1	U	0.25	6.3	U	
Trichlorofluoromethane	OLC02-1-V	µg/L	5	0.15	J	0.55	13	U		0.5	U		1	U	0.25	6.3	U	
1,1-Dichloroethene	OLC02-1-V	µg/L	5	0.5	U	0.25	5.5	J	A	2		#	1	U	5.5	2.2	J	#
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.5	U	0.25	13	U		0.5	U		1	U	0.25	6.3	U	
Methylene Chloride	OLC02-1-V	µg/L	5	0.5	U	0.25	13	UJ		1.2	U		1	U	0.5	1.8	J	#
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.5	U	0.25	13	UJ		0.5	U		1	U	0.25	6.3	UJ	
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	0.33	J	0.72	17		A	21		A	8.8		21	45		A
1,1-Dichloroethane	OLC02-1-V	µg/L	5	0.14	J	0.14	13	U		0.54		#	0.36	J	0.54	6.3	U	
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.49	J	0.49	5.3	J	A	7.8		A	5.3		7.8	2.2	J	#
2-Butanone	OLC02-1-V	µg/L	50	5	U	68	130	U		17		#	10	U	17	63	U	
Chloroform	OLC02-1-V	µg/L	7	0.5	U	0.34	13	UJ		0.5	U		1	U	0.25	6.3	UJ	
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	0.5	U	0.25	13	U		0.89		#	0.34	J	0.89	6.3	U	
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.5	U	0.16	13	U		0.5	U		1	U	0.25	6.3	U	
Benzene	OLC02-1-V	µg/L	1	0.5	U	0.25	13	U		0.58		#	1	U	0.58	6.3	U	
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.5	U	0.25	13	UJ		0.5	U		1	U	0.25	6.3	UJ	
Trichloroethene	OLC02-1-V	µg/L	5	14		18	220		A	94		A	62		220	260		A
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.5	U	0.25	13	U		0.5	U		1	U	0.25	6.3	U	
Toluene	OLC02-1-V	µg/L	5	0.5	U	0.25	13	U		0.35	J	#	1	U	0.35	6.3	U	
Tetrachloroethene	OLC02-1-V	µg/L	5	2.5		3.2	350		A	94		A	150		350	14		A
Dibromochloromethane	OLC02-1-V	µg/L	50	0.5	U	0.25	13	U		0.5	U		1	U	0.25	6.3	U	
Ethylbenzene	OLC02-1-V	µg/L	5	0.5	U	0.25	13	U		0.07	J	#	1	U	0.07	6.3	U	
Xylenes (total)	OLC02-1-V	µg/L	5	0.5	U	0.25	13	U		0.08	J	~	1	U	0.08	6.3	U	
Bromoform	OLC02-1-V	µg/L	50	0.5	U	0.25	13	U		0.5	U		1	U	0.25	6.3	U	
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.5	U	0.25	13	U		0.5	U		1	U	0.25	6.3	U	
						Average									Average			
pH				5.24		5.42	6.43			2.55			6.17		5.05	6.59		

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-5
Estimated VOC Concentrations in EW-1I
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Meth	Sample Code / Sample Nam / Sample Date / Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-04-7-R2 7/17/2006 185 to 190 ft bgs			GWM-04-7-R3 10/20/2008 185 to 190 ft		GWM-04-7 Max	GWM-05-6-R1 4/14/2006 250 to 255 ft bgs			GWM-05-6-R2 7/18/2006 250 to 255 ft bgs			GWM-05-6-R3 10/23/2008 250 to 255 ft		GWM-05-6 Max
(Group Description)																		
LDL-Volatile Organic Compounds																		
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	0.5	U		2.2		4.3	0.5	U		0.5	U		0.5	U	0.25
Chloromethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Trichlorofluoromethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U	0.25	0.5	U		0.5	U		1		1
1,1-Dichloroethene	OLC02-1-V	µg/L	5	0.5	U		0.5	U	2.2	0.5	U		0.5	U		0.5	U	0.25
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Methylene Chloride	OLC02-1-V	µg/L	5	0.5	U		0.5	U	1.8	0.5	U		0.5	U		0.5	U	0.25
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	26	J	A	8.8		45	0.7		#	0.98		#	0.81		0.98
1,1-Dichloroethane	OLC02-1-V	µg/L	5	0.5	U		0.13	J	0.13	0.7		#	1.4		#	0.49	J	1.4
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	2.7		#	1		2.7	0.58		#	1.8		#	0.76		1.8
2-Butanone	OLC02-1-V	µg/L	50	5	U		5	U	2.5	5	U		5	U		5	U	2.5
Chloroform	OLC02-1-V	µg/L	7	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	0.5	U		0.15	J	0.15	0.2	J	#	0.49	J	#	0.5	U	0.49
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Benzene	OLC02-1-V	µg/L	1	0.32	J	#	0.5	U	0.32	0.5	U		0.5	U		0.5	U	0.25
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Trichloroethene	OLC02-1-V	µg/L	5	120		A	62		260	5		#	12		A	4.7		12
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Toluene	OLC02-1-V	µg/L	5	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Tetrachloroethene	OLC02-1-V	µg/L	5	25		A	13		25	0.31	J	#	0.72		#	0.3	J	0.72
Dibromochloromethane	OLC02-1-V	µg/L	50	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Ethylbenzene	OLC02-1-V	µg/L	5	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Xylenes (total)	OLC02-1-V	µg/L	5	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Bromoform	OLC02-1-V	µg/L	50	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
									Average									Average
pH				3.95			5.87		5.47	7.01			4.3			5.34		5.55

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-5
Estimated VOC Concentrations in EW-1I
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Meth	Sample Code / Sample Name / Sample Date / Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-05-7-R1 4/14/2006 190 to 195 ft bgs	GWM-05-7-R2 7/19/2006 190 to 195 ft bgs	GWM-05-7-R3 10/23/2008 190 to 195 ft	GWM-05-7 Max	GWM-10-4-R3 10/22/2008 305 to 310 ft	GWM-10-4 Max	GWM-10-5-R3 10/22/2008 285 to 290 ft
(Group Description)										
LDL-Volatile Organic Compounds										
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	0.5 U	0.5 U	0.5 U	0.25	2	2	0.74 J
Chloromethane	OLC02-1-V	µg/L	5	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
Trichlorofluoromethane	OLC02-1-V	µg/L	5	0.5 U	0.5 U	0.15 J	0.15	1.5	1.5	3.2
1,1-Dichloroethene	OLC02-1-V	µg/L	5	2.7 #	0.5 U	0.5 U	2.7	0.5 U	0.25	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
Methylene Chloride	OLC02-1-V	µg/L	5	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	0.5 #	0.49 J #	0.28 J	0.5	3	3	5.5
1,1-Dichloroethane	OLC02-1-V	µg/L	5	4.4 #	2.7 #	0.56	4.4	0.16 J	0.16	0.28 J
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.23 J #	0.26 J #	0.5 U	0.26	5.2	5.2	8.1
2-Butanone	OLC02-1-V	µg/L	50	5 U	5 U	5 U	2.5	5 U	2.5	10 U
Chloroform	OLC02-1-V	µg/L	7	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	1.6 #	0.97 #	0.5 U	1.6	0.5 U	0.25	1 U
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.5 U	0.12 J #	0.5 U	0.12	0.5 U	0.25	1 U
Benzene	OLC02-1-V	µg/L	1	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
Trichloroethene	OLC02-1-V	µg/L	5	2.6 #	2.1 #	0.55	2.6	58	58	150
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
Toluene	OLC02-1-V	µg/L	5	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
Tetrachloroethene	OLC02-1-V	µg/L	5	0.5 #	0.4 J #	0.13 J	0.5	1.3	1.3	2.1
Dibromochloromethane	OLC02-1-V	µg/L	50	0.5 U	0.06 J #	0.5 U	0.06	0.5 U	0.25	1 U
Ethylbenzene	OLC02-1-V	µg/L	5	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
Xylenes (total)	OLC02-1-V	µg/L	5	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
Bromoform	OLC02-1-V	µg/L	50	0.5 U	0.27 J #	0.5 U	0.27	0.5 U	0.25	1 U
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.5 U	0.5 U	0.5 U	0.25	0.5 U	0.25	1 U
							Average		Average	
pH				5.81	3.89	5.6	5.1	6.86	6.86	6.38

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-5
Estimated VOC Concentrations in EW-1I
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Meth	Sample Code / Sample Nam / Sample Date / Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-10-5-R3-DUP / GWM-110-5-R3 / 10/22/2008 / 285 to 290 ft		GWM-10-5 Max	RW-1I Influent
(Group Description)							
LDL-Volatile Organic Compounds							
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	0.91	J	0.91	4.6
Chloromethane	OLC02-1-V	µg/L	5	1	U	0.5	0.3
Trichlorofluoromethane	OLC02-1-V	µg/L	5	4		4	1.1
1,1-Dichloroethene	OLC02-1-V	µg/L	5	1	U	0.5	1.5
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	1	U	0.5	0.3
Methylene Chloride	OLC02-1-V	µg/L	5	1	U	0.5	0.6
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	1	U	0.5	0.4
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	5.8		5.8	9.8
1,1-Dichloroethane	OLC02-1-V	µg/L	5	0.33	J	0.33	0.9
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	9.4		9.4	4.8
2-Butanone	OLC02-1-V	µg/L	50	10	U	5	20.0
Chloroform	OLC02-1-V	µg/L	7	1	U	0.5	0.3
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	1	U	0.5	0.6
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.22	J	0.22	0.2
Benzene	OLC02-1-V	µg/L	1	1	U	0.5	0.3
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	1	U	0.5	0.3
Trichloroethene	OLC02-1-V	µg/L	5	240		240	106.0
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	1	U	0.5	0.3
Toluene	OLC02-1-V	µg/L	5	1	U	0.5	0.3
Tetrachloroethene	OLC02-1-V	µg/L	5	2.3		2.3	48.4
Dibromochloromethane	OLC02-1-V	µg/L	50	1	U	0.5	0.3
Ethylbenzene	OLC02-1-V	µg/L	5	1	U	0.5	0.3
Xylenes (total)	OLC02-1-V	µg/L	5	1	U	0.5	0.3
Bromoform	OLC02-1-V	µg/L	50	1	U	0.5	0.3
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	1	U	0.5	0.3
						Average	
pH						6.38	5.09

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-6
Estimated VOC Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

		Sample Code	Site-Specific	GWM-02-1-R1			GWM-02-1-R2			GWM-02-1-R3		GWM-02-1	GWM-02-2-R1			GWM-02-2-R2			GWM-02-2-R3		GWM-02-2
		Sample Nam	Groundwater																		
		Sample Date	Screening	4/7/2006			7/13/2006			10/21/2008			4/7/2006			7/13/2006			10/21/2008		
Chemical Name	Analytic Meth	Unit \\ Depth	Criteria	450 to 455 ft bgs			450 to 455 ft bgs			450 to 455 ft		Max	410 to 415 ft bgs			410 to 415 ft bgs			370 to 375 ft		Max
(Group Description)																					
LDL-Volatile Organic Compounds																					
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	6.6		A	0.5	U		3.4		6.6	4.7		#	0.5	U		0.26	J	4.7
Chloromethane	OLC02-1-V	µg/L	5	0.31	J	#	0.5	U		0.13	J	0.31	0.5	U		0.5	U		0.5	U	0.25
Trichlorofluoromethane	OLC02-1-V	µg/L	5	1.2		#	3		#	55		55	58		A	8.2		A	11		58
1,1-Dichloroethene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.46	J	#	0.5	U		0.5	U	0.46
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		2.4		2.4	1.2	J	#	0.5	U		0.5	U	1.2
Methylene Chloride	OLC02-1-V	µg/L	5	0.14	J	#	0.89	U		0.5	U	0.14	0.5	U		0.88	U		0.5	U	0.25
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.22	J	#	0.14	J	0.22
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	0.96		#	0.97		#	0.72		0.97	0.34	J	#	0.54		#	0.99		0.99
1,1-Dichloroethane	OLC02-1-V	µg/L	5	0.12	J	#	0.5	U		0.63		0.63	1.2		#	0.87		#	1		1.2
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.97		#	0.74		#	1.1		1.1	0.86		#	4.1		#	2.2		4.1
2-Butanone	OLC02-1-V	µg/L	50	5	U		5	U		5	U	2.5	5	U		5	U		5	U	2.5
Chloroform	OLC02-1-V	µg/L	7	0.45	J	#	0.5	U		0.5	U	0.45	0.62		#	0.5	U		0.5	U	0.25
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.12	J	0.12	0.24	J	#	0.5	U		0.2	J	0.24
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.14	J	#	0.03	J	#	0.5	U	0.14	0.13	J	#	0.5	U		0.5	U	0.13
Benzene	OLC02-1-V	µg/L	1	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Trichloroethene	OLC02-1-V	µg/L	5	22		A	15		A	14		22	13		A	17		A	12		17
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Toluene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Tetrachloroethene	OLC02-1-V	µg/L	5	2.4		#	1.8		#	1.6		2.4	1.4		#	2.3		#	2		2.3
Dibromochloromethane	OLC02-1-V	µg/L	50	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Ethylbenzene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Xylenes (total)	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Bromoform	OLC02-1-V	µg/L	50	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
												Average									Average
pH				6.55			5.4			6.05		6	6.07			5.9			5.9		5.96

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-6
Estimated VOC Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Meth	Sample Code / Sample Nam / Sample Date / Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-02-3-R1 4/7/2006 370 to 375 ft bgs			GWM-02-3-R2 7/13/2006 370 to 375 ft bgs			GWM-02-3-R3 10/21/2008 370 to 375 ft		GWM-02-3 Max	GWM-02-4-R1 4/7/2006 330 to 335 ft bgs			GWM-02-4-R2 7/13/2006 330 to 335 ft bgs			GWM-02-4-R3 10/21/2008 330 to 335 ft		GWM-02-4 Max
(Group Description)																					
LDL-Volatile Organic Compounds																					
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	3.5		#	0.5	U		0.76		3.5	3.9		#	0.5	U		0.51		3.9
Chloromethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Trichlorofluoromethane	OLC02-1-V	µg/L	5	0.95		#	0.5	U		2		2	0.96		#	0.39	J	#	0.42	J	0.96
1,1-Dichloroethene	OLC02-1-V	µg/L	5	0.41	J	#	0.5	U		0.5	U	0.41	0.5	U		0.5	U		0.5	U	0.25
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Methylene Chloride	OLC02-1-V	µg/L	5	0.5	U		1.3	U		0.5	U	0.25	0.15	J	#	0.73	U		0.5	U	0.15
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.19	J	#	0.58		#	0.28	J	0.58	0.26	J	#	0.35	J	#	0.3	J	0.35
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	0.37	J	#	1.1		#	0.86		1.1	0.6		#	0.58		#	0.63		0.63
1,1-Dichloroethane	OLC02-1-V	µg/L	5	1.1		#	0.38	J	#	0.39	J	1.1	0.26	J	#	0.19	J	#	0.2	J	0.26
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	2.7		#	10		A	4.1		10	5.2		A	5.8		A	4.3		5.8
2-Butanone	OLC02-1-V	µg/L	50	5	U		5	U		5	U	2.5	5	U		5	U		5	U	2.5
Chloroform	OLC02-1-V	µg/L	7	0.31	J	#	0.5	U		0.5	U	0.31	0.34	J	#	0.5	U		0.5	U	0.34
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	0.31	J	#	0.5	U		0.5	U	0.31	0.5	U		0.5	U		0.5	U	0.25
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.06	J	#	0.5	U	0.06
Benzene	OLC02-1-V	µg/L	1	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Trichloroethene	OLC02-1-V	µg/L	5	16		A	38	J	A	23		38	23		A	21		A	22		23
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Toluene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Tetrachloroethene	OLC02-1-V	µg/L	5	1.6		#	4.4		#	3.8		4.4	2.8		#	2.6		#	2.8		2.8
Dibromochloromethane	OLC02-1-V	µg/L	50	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Ethylbenzene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Xylenes (total)	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Bromoform	OLC02-1-V	µg/L	50	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
												Average									Average
pH				5.91			5.5			5.84		5.75	5.89			5			5.51		5.47

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-6
Estimated VOC Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Meth	Sample Code Sample Nam Sample Date Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-02-5-R1 4/7/2006 290 to 295 ft bgs			GWM-02-5-R2 7/13/2006 290 to 295 ft bgs			GWM-02-5-R3 10/21/2008 290 to 295 ft		GWM-02-5 Max	GWM-03-2-R1 3/28/2006 390 to 395 ft bgs			GWM-03-2-R2 7/17/2006 390 to 395 ft bgs			GWM-03-2-R3 10/16/2008 390 to 395 ft		GWM-03-2 Max
(Group Description)																					
LDL-Volatile Organic Compounds																					
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	10		A	0.5	U		0.81		10	0.48	J	#	0.5	U		0.16	J	0.48
Chloromethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Trichlorofluoromethane	OLC02-1-V	µg/L	5	3.1		#	0.44	J	#	0.49	J	3.1	6.8		A	15		A	24		24
1,1-Dichloroethene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.84		#	1		#	1.3		1.3
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Methylene Chloride	OLC02-1-V	µg/L	5	0.5	U		1.6	U		0.5	U	0.25	0.5	U		1.4	U		0.5	U	0.25
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.24	J	#	0.24	J	#	0.25	J	0.25	0.5	U		0.5	U		0.5	U	0.25
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	0.43	J	#	0.67		#	0.65		0.67	0.5	U		0.5	U		0.5	U	0.25
1,1-Dichloroethane	OLC02-1-V	µg/L	5	0.17	J	#	0.17	J	#	0.23	J	0.23	3.5		#	5.8		A	3.7		5.8
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	4.9		#	5.7		A	4.6		5.7	0.25	J	#	0.8		#	0.65		0.8
2-Butanone	OLC02-1-V	µg/L	50	5	U		5	U		5	U	2.5	5	U		5	U		5	U	2.5
Chloroform	OLC02-1-V	µg/L	7	0.24	J	#	0.5	U		0.5	U	0.24	0.5	U		0.5	U		0.5	U	0.25
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.87		#	1.4		#	0.76		1.4
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.1	J	#	0.07	J	#	0.5	U	0.1	0.5	U		0.21	J	#	0.5	U	0.21
Benzene	OLC02-1-V	µg/L	1	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Trichloroethene	OLC02-1-V	µg/L	5	24		A	23	J	A	26		26	3.3		#	14		A	25		25
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Toluene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.04	J	#	0.5	U	0.04
Tetrachloroethene	OLC02-1-V	µg/L	5	5.8		A	2.2		#	3.7		5.8	0.39	J	#	0.5	U		0.5	U	0.39
Dibromochloromethane	OLC02-1-V	µg/L	50	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Ethylbenzene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Xylenes (total)	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
Bromoform	OLC02-1-V	µg/L	50	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.25
												Average									Average
pH				6.02			5.31			5.59		5.64	6.1			5.06			5.87		5.68

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-6
Estimated VOC Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

		Sample Code	Site-Specific	GWM-03-3-R1			GWM-03-3-R2			GWM-03-3-R3		GWM-03-3	GWM-03-4-R1			GWM-03-4-R2			GWM-03-4-R3		GWM-03-4-R3-DUP	
		Sample Nam	Groundwater																		GWM-103-4-R3	
		Sample Date	Screening	3/28/2006			7/17/2006			10/16/2008			3/28/2006			7/17/2006			10/16/2008		10/16/2008	
Chemical Name	Analytic Meth	Unit \\ Depth	Criteria	370 to 375 ft bgs			370 to 375 ft bgs			370 to 375 ft		Max	290 to 295 ft bgs			290 to 295 ft bgs			290 to 295 ft		185 to 190 ft	
(Group Description)																						
LDL-Volatile Organic Compounds																						
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	0.17	J	#	0.5	U		0.5	U	0.17	0.22	J	#	0.5	U		2.3		2.1	
Chloromethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
Trichlorofluoromethane	OLC02-1-V	µg/L	5	7.1		A	9.2		A	10		10	0.5	U		0.5	U		0.5	U	0.5	U
1,1-Dichloroethene	OLC02-1-V	µg/L	5	0.27	J	#	0.5	U		0.5	U	0.27	0.12	J	#	0.5	U		0.5	U	0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
Methylene Chloride	OLC02-1-V	µg/L	5	0.5	U		1	U		0.5	U	0.25	0.5	U		1.3	U		0.5	U	0.5	U
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
1,1-Dichloroethane	OLC02-1-V	µg/L	5	2.6		#	3.3		#	2.1		3.3	0.25	J	#	0.5	U		0.17	J	0.15	J
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.39	J	#	0.61		#	0.27	J	0.61	0.5	U		0.5	U		0.5	U	0.5	U
2-Butanone	OLC02-1-V	µg/L	50	5	U		5	U		5	U	2.5	5	U		5	U		5	U	5	U
Chloroform	OLC02-1-V	µg/L	7	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	0.89		#	0.93		#	0.55		0.93	0.62		#	0.5	U		0.5	U	0.5	U
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
Benzene	OLC02-1-V	µg/L	1	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
Trichloroethene	OLC02-1-V	µg/L	5	8.9		A	13		A	18		18	0.5	U		0.51		#	0.79		0.73	
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
Toluene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
Tetrachloroethene	OLC02-1-V	µg/L	5	0.25	J	#	0.3	J	#	0.15	J	0.3	0.54		#	0.24	J	#	0.25	J	0.2	J
Dibromochloromethane	OLC02-1-V	µg/L	50	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
Ethylbenzene	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
Xylenes (total)	OLC02-1-V	µg/L	5	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
Bromoform	OLC02-1-V	µg/L	50	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U	0.5	U
												Average										
pH				6.18			5.61			6.17		5.99	6.03			5.27			5.81			

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-6
Estimated VOC Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

		Sample Code	Site-Specific	GWM-03-4	GWM-04-2-R1			GWM-04-2-R2			GWM-04-2-R3		GWM-04-2	GWM-04-3-R1			GWM-04-3-R2			GWM-04-3-R3	
		Sample Nam	Groundwater																		
		Sample Date	Screening		4/11/2006			7/14/2006			10/20/2008			4/11/2006			7/14/2006			10/20/2008	
Chemical Name	Analytic Meth	Unit \\ Depth	Criteria	Max	400 to 405 ft bgs			400 to 405 ft bgs			400 to 405 ft		Max	350 to 355 ft bgs			350 to 355 ft bgs			350 to 355 ft	
(Group Description)																					
LDL-Volatile Organic Compounds																					
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	2.3	1	UJ		0.5	U		1.2		1.2	5.2	J	A	11	J	A	10	
Chloromethane	OLC02-1-V	µg/L	5	0.25	1	U		0.5	U		0.5	U	0.25	2.5	U		0.5	U		1	U
Trichlorofluoromethane	OLC02-1-V	µg/L	5	0.25	16		A	9.6		A	10		16	2.8		#	0.5	U		0.49	J
1,1-Dichloroethene	OLC02-1-V	µg/L	5	0.12	1.7		#	4		#	1		4	1.3	J	#	9.7		A	1	U
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.25	1	U		0.5	U		0.5	U	0.25	2.5	U		0.5	U		1	U
Methylene Chloride	OLC02-1-V	µg/L	5	0.25	1.6	U		3		#	0.5	U	3	2	J	#	1.4		#	1	U
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.25	1	UJ		0.5	U		0.5	U	0.25	2.5	UJ		0.45	J	#	0.34	J
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	0.25	1.7		#	2.5		#	0.95		2.5	6.5		#	15		A	7.2	
1,1-Dichloroethane	OLC02-1-V	µg/L	5	0.25	3.3		#	3.3		#	2.6		3.3	2.5	U		1.1		#	0.56	J
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.25	0.82	J	#	2.9		#	0.94		2.9	1.4	J	#	11	J	A	3.9	
2-Butanone	OLC02-1-V	µg/L	50	2.5	10	U		5	U		5	U	2.5	25	U		5	U		10	U
Chloroform	OLC02-1-V	µg/L	7	0.25	2.4	UJ		2.3		#	2		2.3	2.5	UJ		0.53		#	1	U
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	0.62	1.2		#	1.7		#	0.7		1.7	2.5	U		2.7		#	0.4	J
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.25	1.3		#	2.9		#	0.61		2.9	2.5	U		0.29	J	#	1	U
Benzene	OLC02-1-V	µg/L	1	0.25	1	U		0.5	U		0.5	U	0.25	2.5	U		0.7		#	1	U
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.25	1	UJ		0.5	U		0.5	U	0.25	2.5	UJ		0.5	U		1	U
Trichloroethene	OLC02-1-V	µg/L	5	0.79	26		A	22		A	12		26	64		A	180		A	51	
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.26	1	U		0.5	U		0.5	U	0.25	2.5	U		0.5	U		1	U
Toluene	OLC02-1-V	µg/L	5	0.25	1	U		0.5	U		0.5	U	0.25	2.5	U		0.5	U		1	U
Tetrachloroethene	OLC02-1-V	µg/L	5	0.54	20		A	29		A	27		29	21		A	210		A	120	
Dibromochloromethane	OLC02-1-V	µg/L	50	0.25	1	U		0.5	U		0.5	U	0.25	2.5	U		0.5	U		1	U
Ethylbenzene	OLC02-1-V	µg/L	5	0.25	1	U		0.5	U		0.5	U	0.25	2.5	U		0.5	U		1	U
Xylenes (total)	OLC02-1-V	µg/L	5	0.25	1	U		0.5	U		0.5	U	0.25	2.5	U		0.5	U		1	U
Bromoform	OLC02-1-V	µg/L	50	0.26	1	U		0.5	U		0.5	U	0.25	2.5	U		0.5	U		1	U
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.25	1	U		0.5	U		0.5	U	0.25	2.5	U		0.5	U		1	U
				Average									Average								
pH				5.70	6.81			5.1			5.72		5.88	6.56			4.91			6.13	

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-6
Estimated VOC Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Meth	Sample Code / Sample Nam / Sample Date / Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-04-3 Max	GWM-04-4-R1 4/11/2006 305 to 310 ft bgs			GWM-04-4-R2 7/14/2006 305 to 310 ft bgs			GWM-04-4-R3 10/20/2008 305 to 310 ft		GWM-04-4 Max	GWM-04-5-R1 4/11/2006 285 to 290 ft bgs			GWM-04-5-R2 7/14/2006 285 to 290 ft bgs			GWM-04-5-R3 10/20/2008 285 to 290 ft	
(Group Description)																					
LDL-Volatile Organic Compounds																					
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	11	97	J	A	13		A	10		97	64	J	A	12		A	16	
Chloromethane	OLC02-1-V	µg/L	5	0.25	8.4	U		0.5	U		1	U	0.25	6.3	U		0.5	U		1	U
Trichlorofluoromethane	OLC02-1-V	µg/L	5	2.8	8.4	U		0.5	U		1	U	0.25	6.3	U		0.11	J	#	1	U
1,1-Dichloroethene	OLC02-1-V	µg/L	5	9.7	8.9		A	4.8		#	1	U	8.9	7.8		A	3.4		#	1.8	
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.25	8.4	U		0.5	U		1	U	0.25	6.3	U		0.5	U		1	U
Methylene Chloride	OLC02-1-V	µg/L	5	2	3.8	J	#	1.3		#	1	U	3.8	2.3	J	#	1.4		#	1	U
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.45	8.4	UJ		0.5	U		1	U	0.25	6.3	UJ		0.5	U		1	U
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	15	10		#	13		A	7.1		13	12		A	18		A	7.7	
1,1-Dichloroethane	OLC02-1-V	µg/L	5	1.1	8.4	U		0.52		#	0.36	J	0.52	6.3	U		0.49	J	#	0.46	J
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	11	3.9	J	#	5		#	3.8		5	3.6	J	#	4.7		#	4.7	
2-Butanone	OLC02-1-V	µg/L	50	2.5	84	U		5	U		10	U	2.5	63	U		5	U		10	U
Chloroform	OLC02-1-V	µg/L	7	0.53	8.4	UJ		0.5	U		1	U	0.25	6.3	UJ		0.5	U		1	U
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	2.7	2.4	J	#	1.7		#	0.41	J	2.4	2.3	J	#	1.2		#	0.54	J
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.29	8.4	U		0.12	J	#	1	U	0.12	6.3	U		0.08	J	#	1	U
Benzene	OLC02-1-V	µg/L	1	0.7	8.4	U		0.43	J	#	1	U	0.43	6.3	U		0.36	J	#	1	U
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.25	8.4	UJ		0.5	U		1	U	0.25	6.3	UJ		0.96		A	1	U
Trichloroethene	OLC02-1-V	µg/L	5	180	280		A	200		A	56		280	260		A	130		A	78	
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.25	8.4	U		0.5	U		1	U	0.25	6.3	U		0.5	U		1	U
Toluene	OLC02-1-V	µg/L	5	0.25	8.4	U		0.04	J	#	1	U	0.04	6.3	U		0.5	U		1	U
Tetrachloroethene	OLC02-1-V	µg/L	5	210	180		A	200		A	140		200	220		A	100		A	200	
Dibromochloromethane	OLC02-1-V	µg/L	50	0.25	8.4	U		0.5	U		1	U	0.25	6.3	U		0.07	J	#	1	U
Ethylbenzene	OLC02-1-V	µg/L	5	0.25	8.4	U		0.5	U		1	U	0.25	6.3	U		0.5	U		1	U
Xylenes (total)	OLC02-1-V	µg/L	5	0.25	8.4	U		0.5	U		1	U	0.25	6.3	U		0.5	U		1	U
Bromoform	OLC02-1-V	µg/L	50	0.25	8.4	U		0.5	U		1	U	0.25	6.3	U		0.5	U		1	U
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.25	8.4	U		0.5	U		1	U	0.25	6.3	U		0.06	J	#	1	U
				Average									Average								
pH				5.87	6.98			5.16			5.65		5.93	6.69			5.19			6.17	

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-6
Estimated VOC Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Meth	Sample Code Sample Nam Sample Date Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-04-5 Max	GWM-05-3-R1 4/14/2006 355 to 360 ft bgs			GWM-05-3-R2 7/19/2006 355 to 360 ft bgs			GWM-05-3-R3 10/23/2008 355 to 360 ft		GWM-05-3 Max	GWM-05-4-R1 4/14/2006 310 to 315 ft bgs			GWM-05-4-R2 7/19/2006 310 to 315 ft bgs			GWM-05-4-R3 10/23/2008 310 to 315 ft	
(Group Description)																					
LDL-Volatile Organic Compounds																					
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	64	22		A	0.5	U		13		22	17		A	0.5	U		2.3	
Chloromethane	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
Trichlorofluoromethane	OLC02-1-V	µg/L	5	0.11	0.37	J	#	0.5	U		0.16	J	0.37	0.46	J	#	0.5	U		0.33	J
1,1-Dichloroethene	OLC02-1-V	µg/L	5	7.8	0.37	J	#	0.5	U		0.5	U	0.37	0.4	J	#	0.5	U		0.5	U
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
Methylene Chloride	OLC02-1-V	µg/L	5	2.3	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	18	0.8		#	0.95		#	2.8		2.8	1.8		#	1.6		#	5	
1,1-Dichloroethane	OLC02-1-V	µg/L	5	0.49	2		#	1.7		#	1.6		2	3		#	2.3		#	1.1	
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	4.7	0.97		#	1.8		#	0.36	J	1.8	1.1		#	2		#	0.74	
2-Butanone	OLC02-1-V	µg/L	50	2.5	5	U		5	U		5	U	2.5	5	U		5	U		5	U
Chloroform	OLC02-1-V	µg/L	7	0.25	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	2.3	0.15	J	#	0.05	J	#	0.5	U	0.15	0.18	J	#	0.17	J	#	0.5	U
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.08	0.17	J	#	0.19	J	#	0.5	U	0.19	0.5	U		0.11	J	#	0.5	U
Benzene	OLC02-1-V	µg/L	1	0.36	0.12	J	#	0.13	J	#	0.5	U	0.13	0.11	J	#	0.03	J	#	0.5	U
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.96	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
Trichloroethene	OLC02-1-V	µg/L	5	260	12		A	14		A	4.3		14	14		A	18		A	8.7	
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.25	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
Toluene	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
Tetrachloroethene	OLC02-1-V	µg/L	5	220	0.55		#	0.63		#	0.5	J	0.63	0.72		#	0.73		#	0.42	J
Dibromochloromethane	OLC02-1-V	µg/L	50	0.07	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
Ethylbenzene	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
Xylenes (total)	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
Bromoform	OLC02-1-V	µg/L	50	0.25	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.06	0.5	U		0.5	U		0.5	U	0.25	0.5	U		0.5	U		0.5	U
				Average									Average								
pH				6.02	6.09			4.09			5.18		5.12	5.81			3.77			5.68	

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-6
Estimated VOC Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

		Sample Cod	Site-Specific	GWM-05-4	GWM-05-5-R1			GWM-05-5-R2			GWM-05-5-R3		GWM-05-5	GWM-10-2-R3		GWM-10-2	GWM-10-3-R3	
		Sample Nam	Groundwater															
		Sample Date	Screening		4/14/2006			7/19/2006			10/23/2008			10/22/2008			10/22/2008	
Chemical Name	Analytic Meth	Unit \\ Depth	Criteria	Max	290 to 295 ft bgs			290 to 295 ft bgs			290 to 295 ft		Max	400 to 405 ft		Max	350 to 355 ft	
(Group Description)																		
LDL-Volatile Organic Compounds																		
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	17	3.5		#	0.5	U		1.3		3.5	5	U	2.5	14	
Chloromethane	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
Trichlorofluoromethane	OLC02-1-V	µg/L	5	0.46	0.56		#	0.64		#	0.37	J	0.64	5	U	2.5	1	U
1,1-Dichloroethene	OLC02-1-V	µg/L	5	0.4	0.44	J	#	0.5	U		0.5	U	0.44	5	U	2.5	5.7	
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
Methylene Chloride	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	3.9	
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	5	1.1		#	1.2		#	5.8		5.8	5	U	2.5	1	U
1,1-Dichloroethane	OLC02-1-V	µg/L	5	3	1.8		#	1.6		#	0.97		1.8	5	U	2.5	1.3	
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	2	1.7		#	2		#	0.95		2	55		55	16	
2-Butanone	OLC02-1-V	µg/L	50	2.5	5	U		5	U		5	U	2.5	50	U	25	10	U
Chloroform	OLC02-1-V	µg/L	7	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	0.18	0.26	J	#	0.2	J	#	0.5	U	0.26	5	U	2.5	1.4	
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.11	0.12	J	#	0.12	J	#	0.5	U	0.12	5	U	2.5	1	U
Benzene	OLC02-1-V	µg/L	1	0.11	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
Trichloroethene	OLC02-1-V	µg/L	5	18	19		A	18		A	10		19	540		540	120	
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
Toluene	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
Tetrachloroethene	OLC02-1-V	µg/L	5	0.73	0.62		#	0.6		#	0.41	J	0.62	13		13	92	
Dibromochloromethane	OLC02-1-V	µg/L	50	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
Ethylbenzene	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
Xylenes (total)	OLC02-1-V	µg/L	5	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
Bromoform	OLC02-1-V	µg/L	50	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.25	0.5	U		0.5	U		0.5	U	0.25	5	U	2.5	1	U
				Average									Average			Average		
pH				5.09	5.79			4.2			4.84		4.94	6.48		6.48	6.85	

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-6
Estimated VOC Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Meth	Sample Code / Sample Nam / Sample Date / Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-10-3 Max	RW-1D Influent
(Group Description)					
LDL-Volatile Organic Compounds					
Dichlorodifluoromethane	OLC02-1-V	µg/L	5	14	15.5
Chloromethane	OLC02-1-V	µg/L	5	0.5	0.4
Trichlorofluoromethane	OLC02-1-V	µg/L	5	0.5	10.4
1,1-Dichloroethene	OLC02-1-V	µg/L	5	5.7	2.5
1,1,2-Trichloro-1,2,2-trifluoroethane	OLC02-1-V	µg/L	5	0.5	0.6
Methylene Chloride	OLC02-1-V	µg/L	5	0.5	1.0
trans-1,2-Dichloroethene	OLC02-1-V	µg/L	5	3.9	0.6
Methyl tert-Butyl Ether	OLC02-1-V	µg/L	10	0.5	4.1
1,1-Dichloroethane	OLC02-1-V	µg/L	5	1.3	1.7
cis-1,2-Dichloroethene	OLC02-1-V	µg/L	5	16	7.6
2-Butanone	OLC02-1-V	µg/L	50	5	4.0
Chloroform	OLC02-1-V	µg/L	7	0.5	0.6
1,1,1-Trichloroethane	OLC02-1-V	µg/L	5	1.4	1.0
Carbon Tetrachloride	OLC02-1-V	µg/L	5	0.5	0.5
Benzene	OLC02-1-V	µg/L	1	0.5	0.4
1,2-Dichloroethane	OLC02-1-V	µg/L	0.6	0.5	0.4
Trichloroethene	OLC02-1-V	µg/L	5	120	95.7
cis-1,3-Dichloropropene	OLC02-1-V	µg/L	0.4	0.5	0.4
Toluene	OLC02-1-V	µg/L	5	0.5	0.4
Tetrachloroethene	OLC02-1-V	µg/L	5	92	46.2
Dibromochloromethane	OLC02-1-V	µg/L	50	0.5	0.4
Ethylbenzene	OLC02-1-V	µg/L	5	0.5	0.4
Xylenes (total)	OLC02-1-V	µg/L	5	0.5	0.4
Bromoform	OLC02-1-V	µg/L	50	0.5	0.4
1,4-Dichlorobenzene	OLC02-1-V	µg/L	3	0.5	0.4
				Average	
pH				6.85	5.79

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-7
Estimated Iron/Manganese Concentrations in EW-1S
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Method	Sample Code Sample Name Sample Date Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWX-10019-R1 3/22/2006 223 to 228 ft bgs			GWX-10019-R2 7/11/2006 223 to 228 ft bgs			GWX-10019-R3 10/20/2008	GWX-10019 Max	GWM-10-6-R3 10/22/2008	GWM-10-6 Max	EW-1S Influent
(Group Description)														
Inorganic Analytes														
Silver	ILM04-1-M	ug/L	50	6	U		10	U						
Aluminum	ILM04-1-M	ug/L	200	200	U		200	U						
Arsenic	ILM04-1-M	ug/L	10	8	U		10	U						
Barium	ILM04-1-M	ug/L	1000	43		#	200	U						
Beryllium	ILM04-1-M	ug/L	3	5	U		5	U						
Cadmium	ILM04-1-M	ug/L	5	4	U		5	U						
Cobalt	ILM04-1-M	ug/L	50	12		#	10.9	J	#					
Chromium	ILM04-1-M	ug/L	50	6	U		3.8	J	#					
Copper	ILM04-1-M	ug/L	200	10	U		25	U						
Iron	ILM04-1-M	ug/L	300	9800		A	5140		A	19000	19000	170	170	9585
Manganese	ILM04-1-M	ug/L	300	380		A	265		#	150	380	220	220	300
Nickel	ILM04-1-M	ug/L	100	11		#	40	U						
Lead	ILM04-1-M	ug/L	15	25		A	10.4		#					
Selenium	ILM04-1-M	ug/L	10	7	U		35	U						
Antimony	ILM04-1-M	ug/L	3	14	U		60	U						
Thallium	ILM04-1-M	ug/L	0.5	20	U		25	U						
Vanadium	ILM04-1-M	ug/L	50	10	U		50	U						
Zinc	ILM04-1-M	ug/L	5000	39	J	#	60	U						
Calcium	ILM04-1-M	ug/L	11600	16000		A	16900		A					
Potassium	ILM04-1-M	ug/L	5000	3600		#	5000	UJ						
Magnesium	ILM04-1-M	ug/L	35000	7100		#	7710		#					
Sodium	ILM04-1-M	ug/L	20000	40000	L	A	45600		A					
Mercury	ILM04-1-M	ug/L	0.7	0.2	U		0.2	UJ						
Cyanide	ILM04-1-CN	ug/L	200	5	U		10	U						

Notes:
μg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-8
Estimated Iron/Manganese Concentrations in EW-1I
Old Roosevelt Field Superfund Site
Garden City, New York

		Sample Code Sample Name Sample Date Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-02-6-R1-2 4/11/2006 250 to 255 ft bgs			GWM-02-6-R2 7/14/2006 250 to 255 ft bgs			GWM-02-6 Max	GWM-02-7-R3 10/21/2008			GWM-02-7 Max	GWM-04-7-R1 4/11/2006 185 to 190 ft bgs		
Chemical Name	Analytic Method																
(Group Description)																	
Inorganic Analytes																	
Silver	ILM04-1-M	ug/L	50	6	U		10	U							6	U	
Aluminum	ILM04-1-M	ug/L	200	200	U		200	U							200	U	
Arsenic	ILM04-1-M	ug/L	10	8	U		10	U							8	U	
Barium	ILM04-1-M	ug/L	1000	16		#	200	U							56		#
Beryllium	ILM04-1-M	ug/L	3	5	U		5	U							5	U	
Cadmium	ILM04-1-M	ug/L	5	4	U		5	U							4	U	
Cobalt	ILM04-1-M	ug/L	50	8	U		1.5	J	#						8	U	
Chromium	ILM04-1-M	ug/L	50	6	U		8.5	J	#						6	U	
Copper	ILM04-1-M	ug/L	200	10	U		25	U							10	U	
Iron	ILM04-1-M	ug/L	300	100	U		45.9	J	#	45.9	51			51	100	U	
Manganese	ILM04-1-M	ug/L	300	43		#	82.1		#	82.1	120			120	370		A
Nickel	ILM04-1-M	ug/L	100	5	U		8.6	J	#						19		#
Lead	ILM04-1-M	ug/L	15	7	U		10	U							7	U	
Selenium	ILM04-1-M	ug/L	10	7	U		35	U							7	U	
Antimony	ILM04-1-M	ug/L	3	14	U		60	U							14	U	
Thallium	ILM04-1-M	ug/L	0.5	20	U		25	U							20	U	
Vanadium	ILM04-1-M	ug/L	50	10	U		50	U							10	U	
Zinc	ILM04-1-M	ug/L	5000	29		#	27.6	J	#						40		#
Calcium	ILM04-1-M	ug/L	11600	6500		#	7050		#						17000		A
Potassium	ILM04-1-M	ug/L	5000	2800		#	5000	UJ							4700		#
Magnesium	ILM04-1-M	ug/L	35000	2200		#	2550	J	#						5000		#
Sodium	ILM04-1-M	ug/L	20000	33000	L	A	25600		A						80000	L	A
Mercury	ILM04-1-M	ug/L	0.7	0.2	U		0.2	UJ							0.2	U	
Cyanide	ILM04-1-CN	ug/L	200	5	U		10	U							5	U	

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-8
Estimated Iron/Manganese Concentrations in EW-1I
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Method	Sample Code / Sample Name / Sample Date / Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-04-7-R2 7/17/2006 185 to 190 ft bgs			GWM-04-7-R3 10/20/2008			GWM-04-7-R3-DUP 10/20/2008			GWM-04-7 Max			GWM-05-6-R1 4/14/2006 250 to 255 ft bgs			GWM-05-6-R2 7/18/2006 250 to 255 ft bgs		
(Group Description)																					
Inorganic Analytes																					
Silver	ILM04-1-M	ug/L	50	35	U											6	U		35	U	
Aluminum	ILM04-1-M	ug/L	200	200	U											200	U		200	U	
Arsenic	ILM04-1-M	ug/L	10	10	U											8	U		10	U	
Barium	ILM04-1-M	ug/L	1000	200	U											81		#	200	U	
Beryllium	ILM04-1-M	ug/L	3	5	U											5	U		5	U	
Cadmium	ILM04-1-M	ug/L	5	5	U											4	U		5	U	
Cobalt	ILM04-1-M	ug/L	50	2.8	J	#										8	U		4.8	J	#
Chromium	ILM04-1-M	ug/L	50	17.4		#										17		#	34.3		#
Copper	ILM04-1-M	ug/L	200	25	U											10	U		25	U	
Iron	ILM04-1-M	ug/L	300	178		#	120			87			178			130		#	140		#
Manganese	ILM04-1-M	ug/L	300	462		A	170			170			462			87		#	61.1		#
Nickel	ILM04-1-M	ug/L	100	13.3	J	#										47		#	61.1		#
Lead	ILM04-1-M	ug/L	15	10	U											7	U		10	U	
Selenium	ILM04-1-M	ug/L	10	35	U											7	U		35	U	
Antimony	ILM04-1-M	ug/L	3	60	U											14	U		60	U	
Thallium	ILM04-1-M	ug/L	0.5	25	U											20	U		25	U	
Vanadium	ILM04-1-M	ug/L	50	50	U											10	U		50	U	
Zinc	ILM04-1-M	ug/L	5000	23.8	J	#										30		#	19.3	J	#
Calcium	ILM04-1-M	ug/L	11600	15100		A										25000		A	24.8		A
Potassium	ILM04-1-M	ug/L	5000	5000	UJ											3300		#	5000	UJ	
Magnesium	ILM04-1-M	ug/L	35000	4940	J	#										11000		#	11400		#
Sodium	ILM04-1-M	ug/L	20000	79400		A										120000	L	A	109000		A
Mercury	ILM04-1-M	ug/L	0.7	0.2	U											0.2	U		0.2	U	
Cyanide	ILM04-1-CN	ug/L	200	10	U											5	U		10	U	

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-8
Estimated Iron/Manganese Concentrations in EW-1I
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Method		Site-Specific Groundwater Screening Criteria	GWM-05-6	GWM-05-7-R3	GWM-05-7	GWM-10-4-R3	GWM-10-4	EW-1I Influent
		Sample Code							
		Sample Name							
		Sample Date			10/23/2008		10/22/2008		
		Unit \\ Depth		Max		Max	305 to 310 ft bgs	Max	
(Group Description)									
Inorganic Analytes									
Silver	ILM04-1-M	ug/L	50						
Aluminum	ILM04-1-M	ug/L	200						
Arsenic	ILM04-1-M	ug/L	10						
Barium	ILM04-1-M	ug/L	1000						
Beryllium	ILM04-1-M	ug/L	3						
Cadmium	ILM04-1-M	ug/L	5						
Cobalt	ILM04-1-M	ug/L	50						
Chromium	ILM04-1-M	ug/L	50						
Copper	ILM04-1-M	ug/L	200						
Iron	ILM04-1-M	ug/L	300	140	9200	9200	640	640	1709
Manganese	ILM04-1-M	ug/L	300	87	170	170	91	91	169
Nickel	ILM04-1-M	ug/L	100						
Lead	ILM04-1-M	ug/L	15						
Selenium	ILM04-1-M	ug/L	10						
Antimony	ILM04-1-M	ug/L	3						
Thallium	ILM04-1-M	ug/L	0.5						
Vanadium	ILM04-1-M	ug/L	50						
Zinc	ILM04-1-M	ug/L	5000						
Calcium	ILM04-1-M	ug/L	11600						
Potassium	ILM04-1-M	ug/L	5000						
Magnesium	ILM04-1-M	ug/L	35000						
Sodium	ILM04-1-M	ug/L	20000						
Mercury	ILM04-1-M	ug/L	0.7						
Cyanide	ILM04-1-CN	ug/L	200						

Notes:
μg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-9
Estimated Iron/Manganese Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Method	Sample Code Sample Name Sample Date Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-02-2-R3 10/21/2008		GWM-02-2 Max	GWM-02-4-R3 10/21/2008	GWM-02-4 Max	GWM-03-3-R1 3/28/2006 370 to 375 ft bgs			GWM-03-3-R2 7/17/2006 370 to 375 ft bgs		
(Group Description)														
Inorganic Analytes														
Silver	ILM04-1-M	µg/L	50						6	U		35	U	
Aluminum	ILM04-1-M	µg/L	200						200	U		200	U	
Arsenic	ILM04-1-M	µg/L	10						8	U		10	U	
Barium	ILM04-1-M	µg/L	1000						95		#	200	U	
Beryllium	ILM04-1-M	µg/L	3						5	U		5	U	
Cadmium	ILM04-1-M	µg/L	5						4	U		5	U	
Cobalt	ILM04-1-M	µg/L	50						8	U		1.2	J	#
Chromium	ILM04-1-M	µg/L	50						20		#	24.3		#
Copper	ILM04-1-M	µg/L	200						10	U		25	U	
Iron	ILM04-1-M	µg/L	300	50	U	25	190	190	310		A	178		#
Manganese	ILM04-1-M	µg/L	300	170		170	130	130	19		#	46.9		#
Nickel	ILM04-1-M	µg/L	100						93		#	87.1		#
Lead	ILM04-1-M	µg/L	15						7	U		10	U	
Selenium	ILM04-1-M	µg/L	10						7	U		35	U	
Antimony	ILM04-1-M	µg/L	3						14	U		60	U	
Thallium	ILM04-1-M	µg/L	0.5						20	U		25	U	
Vanadium	ILM04-1-M	µg/L	50						10	U		50	U	
Zinc	ILM04-1-M	µg/L	5000						28		#	619		#
Calcium	ILM04-1-M	µg/L	11600						33000		A	10500		#
Potassium	ILM04-1-M	µg/L	5000						6200		A	5000	UJ	
Magnesium	ILM04-1-M	µg/L	35000						5400		#	1900	J	#
Sodium	ILM04-1-M	µg/L	20000						100000	L	A	54000		A
Mercury	ILM04-1-M	µg/L	0.7						0.2	U		0.2	U	
Cyanide	ILM04-1-CN	µg/L	200						5	U		10	U	

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-9
Estimated Iron/Manganese Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Method	Sample Code Sample Name Sample Date Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-03-3 Max	GWM-04-2-R3 10/20/2008	GWM-04-2 Max	GWM-04-4-R3 10/20/2008	GWM-04-4 Max	GWM-05-4-R3 10/23/2008	GWM-05-4 Max
(Group Description)										
Inorganic Analytes										
Silver	ILM04-1-M	µg/L	50							
Aluminum	ILM04-1-M	µg/L	200							
Arsenic	ILM04-1-M	µg/L	10							
Barium	ILM04-1-M	µg/L	1000							
Beryllium	ILM04-1-M	µg/L	3							
Cadmium	ILM04-1-M	µg/L	5							
Cobalt	ILM04-1-M	µg/L	50							
Chromium	ILM04-1-M	µg/L	50							
Copper	ILM04-1-M	µg/L	200							
Iron	ILM04-1-M	µg/L	300	310	520	520	130	130	1300	1300
Manganese	ILM04-1-M	µg/L	300	46.9	130	130	190	190	88	88
Nickel	ILM04-1-M	µg/L	100							
Lead	ILM04-1-M	µg/L	15							
Selenium	ILM04-1-M	µg/L	10							
Antimony	ILM04-1-M	µg/L	3							
Thallium	ILM04-1-M	µg/L	0.5							
Vanadium	ILM04-1-M	µg/L	50							
Zinc	ILM04-1-M	µg/L	5000							
Calcium	ILM04-1-M	µg/L	11600							
Potassium	ILM04-1-M	µg/L	5000							
Magnesium	ILM04-1-M	µg/L	35000							
Sodium	ILM04-1-M	µg/L	20000							
Mercury	ILM04-1-M	µg/L	0.7							
Cyanide	ILM04-1-CN	µg/L	200							

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-9
Estimated Iron/Manganese Concentrations in EW-1D
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Analytic Method	Sample Code Sample Name Sample Date Unit \\ Depth	Site-Specific Groundwater Screening Criteria	GWM-10-2-R3 10/22/2008	GWM-10-2 Max	EW-1D Influent
(Group Description)						
Inorganic Analytes						
Silver	ILM04-1-M	µg/L	50			
Aluminum	ILM04-1-M	µg/L	200			
Arsenic	ILM04-1-M	µg/L	10			
Barium	ILM04-1-M	µg/L	1000			
Beryllium	ILM04-1-M	µg/L	3			
Cadmium	ILM04-1-M	µg/L	5			
Cobalt	ILM04-1-M	µg/L	50			
Chromium	ILM04-1-M	µg/L	50			
Copper	ILM04-1-M	µg/L	200			
Iron	ILM04-1-M	µg/L	300	610	610	441
Manganese	ILM04-1-M	µg/L	300	170	170	132
Nickel	ILM04-1-M	µg/L	100			
Lead	ILM04-1-M	µg/L	15			
Selenium	ILM04-1-M	µg/L	10			
Antimony	ILM04-1-M	µg/L	3			
Thallium	ILM04-1-M	µg/L	0.5			
Vanadium	ILM04-1-M	µg/L	50			
Zinc	ILM04-1-M	µg/L	5000			
Calcium	ILM04-1-M	µg/L	11600			
Potassium	ILM04-1-M	µg/L	5000			
Magnesium	ILM04-1-M	µg/L	35000			
Sodium	ILM04-1-M	µg/L	20000			
Mercury	ILM04-1-M	µg/L	0.7			
Cyanide	ILM04-1-CN	µg/L	200			

Notes:
µg/L = micrograms per liter
U = Not detected
J = Estimated
R = Rejected

Table B-10
Estimated Influent VOC and Iron/Manganese Concentrations
Old Roosevelt Field Superfund Site
Garden City, New York

Chemical Name	Unit	EW-1S *	EW-1I *	EW-1D *	Average Weighted Concentrations	Influent Concentration**
Flow Rate	gpm	60	60	80	200	200
Dichlorodifluoromethane	µg/L	0.4	4.6	15.5	7.7	7.7
Chloromethane	µg/L	0.3	0.3	0.4	0.3	0.3
Trichlorofluoromethane	µg/L	0.8	1.1	10.4	4.7	4.7
1,1-Dichloroethene	µg/L	0.3	1.5	2.5	1.5	1.5
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	0.3	0.3	0.6	0.4	0.4
Methylene Chloride	µg/L	0.2	0.6	1.0	0.6	0.6
trans-1,2-Dichloroethene	µg/L	0.2	0.4	0.6	0.4	0.4
Methyl tert-Butyl Ether	µg/L	8.5	9.8	4.1	7.1	7.1
1,1-Dichloroethane	µg/L	0.4	0.9	1.7	1.1	1.1
cis-1,2-Dichloroethene	µg/L	12.1	4.8	7.6	8.1	8.1
2-Butanone	µg/L	2.5	20.0	4.0	8.4	8.4
Chloroform	µg/L	0.3	0.3	0.6	0.4	0.4
1,1,1-Trichloroethane	µg/L	0.2	0.6	1.0	0.6	0.6
Carbon Tetrachloride	µg/L	0.2	0.2	0.5	0.3	0.3
Benzene	µg/L	0.3	0.3	0.4	0.3	0.3
1,2-Dichloroethane	µg/L	0.6	0.3	0.4	0.4	0.4
Trichloroethene	µg/L	110.8	106.0	95.7	**103.3**	**139.7**
cis-1,3-Dichloropropene	µg/L	0.2	0.3	0.4	0.3	0.3
Toluene	µg/L	0.3	0.3	0.4	0.3	0.3
Tetrachloroethene	µg/L	1.4	48.4	46.2	**33.4**	**53.1**
Dibromochloromethane	µg/L	0.3	0.3	0.4	0.3	0.3
Ethylbenzene	µg/L	0.3	0.3	0.4	0.3	0.3
Xylenes (total)	µg/L	0.3	0.3	0.4	0.3	0.3
Bromoform	µg/L	0.3	0.3	0.4	0.3	0.3
1,4-Dichlorobenzene	µg/L	0.3	0.3	0.4	0.3	0.3
Iron	mg/L	9.585	1.709	0.441	**3.6**	**3.6**
Manganese	mg/L	0.300	0.169	0.132	0.2	0.2
Average pH		6.85	5.09	5.79	5.9	5 ***

Note:
* - VOC and Iron/Manganese concentrations based on Tables B-4 through B-6, and Tables B-7 through B-9, respectively.
** - The higher concentrations of average weighted concentraions and modeling concenrations are used for influent concentrations.
*** - The average pH of two Garden City supply wells is 5. To be conservative, 5 is selected to be the influent pH.

Based on GW Modeling Concentrations

Chemical Name	Unit	RWS *	RWI *	RWD *	Modeling Influent Concentrations
Flow Rate	gpm	60	60	80	200
Tetrachloroethene	µg/L	31	78	51	**53.1**
Trichloroethene	µg/L	155	164	110	**139.7**

Appendix C

Appendix C

Air Guide-1 Model Results

Calculated by: J. Lee Date: 9/9/09
Checked by: G. Chen Date: 9/9/09

Scenario 1: No vapor phase GAC

1 Input Data Summary for Air Guide 1 Program
Assuming 100 percent VOC removal by Air Stripper and no vapor phase GAC
Influent Flow (gpm): 250

Input Air Toxic Concentrations

CAS Number	Chemical Name	Unit	Estimated Influent Concentration	Mass Discharged to Air lbs/hr	lb/yr	ton/yr
Low Detection Limit Volatile Organic Compounds						
156-59-2	cis-1,2-Dichloroethene	ug/L	8.1	0.001013963	8.88232	0.004441
75-71-8	Dichlorodifluoromethane	ug/L	7.7	0.000963891	8.443687	0.004222
79-01-6	Trichloroethene	ug/L	139.7	0.017487741	153.1926	0.076596
127-18-4	Tetrachloroethene	ug/L	53.1	0.006647094	58.22854	0.029114

Input Parameters		
Diameter	8.625	in
Flow Rate	2100	cfm
Air Velocity	5178.38	ft/min
	86.31	ft/sec
Temperature	55	°F
Stack Height	20	ft
Distance to property line	10	ft

2 Air Guide 1 Data Output:
Page 1: Displays the input parameters as shown above.
Page 2: Displays the contaminant Toxicity Profile: For each expected contaminant, the air emission criteria including the short-term guidance concentrations (SGC) and annual guidance concentrations (AGC) are stated along with the toxicity ranking of the contaminant.
Page 3: Displays the expected influent concentrations as shown above.
Page 4: Display the model calculated short-term impact, cavity impact, and source area impact of each air contaminant in concentrations.
Page 5: Display the percentage of calculated short-term impact, cavity impact, and source area impact compared to the AGCs and SGCs. From this analysis, all impacts are below 100 percent of the AGCs and SGCs.

3 Conclusion:
No vapor phase treatment is required.

Abbreviations:
GAC: granulated activated carbon
gpm: gallons per minute
hr: hour
lb: pound
ug/L: micrograms per liter
VOC: volatile organic compound
yr: year

** DAR-1 ANALYSIS **

********** INPUT DATA **********

LOC	FAC	E.P.	CAS #	SOURCE TYPE	HA, or h(AREA) FEET	hs FEET	D IN.	T F	V FPS	Q ACFM	EMISSIONS #/HOUR	EMISSIONS #/YEAR	DPL, or D(AREA) FT	BW, or S(AREA) FT	BL FT
Facility Name & Address:								clinton road			Garden City		Application:		
SIC Code: 0			Source Code:	UTME:		0.	UTMN:		0.	ZONE: 18	BL FACING DIRECTION:	0.0	%CONTROL:	0.0000	
			00156-59-2	POINT	20.	20.	9.	55.	86.40	2100.00	0.00101	9.	10.	33.	33.
Facility Name & Address:								clinton road			Garden City		Application:		
SIC Code: 0			Source Code:	UTME:		0.	UTMN:		0.	ZONE: 18	BL FACING DIRECTION:	0.0	%CONTROL:	0.0000	
			00075-71-8	POINT	20.	20.	9.	55.	86.40	2100.00	0.00096	8.	10.	33.	33.
Facility Name & Address:								clinton road			Garden City		Application:		
SIC Code: 0			Source Code:	UTME:		0.	UTMN:		0.	ZONE: 18	BL FACING DIRECTION:	0.0	%CONTROL:	0.0000	
			00079-01-6	POINT	20.	20.	9.	55.	86.40	2100.00	0.01749	153.	10.	33.	33.
Facility Name & Address:								clinton road			Garden City		Application:		
SIC Code: 0			Source Code:	UTME:		0.	UTMN:		0.	ZONE: 18	BL FACING DIRECTION:	0.0	%CONTROL:	0.0000	
			00127-18-4	POINT	20.	20.	9.	55.	86.40	2100.00	0.00665	58.	10.	33.	33.

CONTAMINANT TOXICITY PROFILE FOR DAR-1 ANALYSIS

CONTAMINANT NAME	CAS NUMBER	SGC ug/m3	HOW SGC ASSIGNED	AGC ug/m3	HOW AGC ASSIGNED	DAR TOXICITY	COMMENTS
DICHLORODIFLUOROMETH	00075-71-8	0.00000	NO SGC EXISTS	12000.000000000	ACGIH TWA-TLV		I
TRICHLOROETHYLENE	00079-01-6	14000.00000	ACGIH STEL	0.500000000	NYSDEC	MODERATE	B,H,U
TETRACHLOROETHYLENE	00127-18-4	1000.00000	NYSDOH	1.000000000	NYSDOH	MODERATE	H,I,U
DICHLOROETHYLENE,cis	00156-59-2	0.00000	NO SGC EXISTS	63.000000000	NYSDEC	MODERATE	

COMMENTS :

(B) ACGIH Suspected Human Carcinogen.

(H) HAP identified by 1990 CAAA.

(I) Refer to ACGIH Handbook.

(U) AGC equivalent to "one in a million risk".

CONTAMINANT EMISSIONS SUMMARY FOR DAR-1 ANALYSIS

CAS NUMBER	CONTAMINANT NAME	# OF EMISSIONS POINTS PER CONTAMINANT	EMISSIONS (lbs/hour)	EMISSIONS (lbs/year)
00075-71-8	DICHLORODIFLUOROMETH	1	0.00096390	8.44369
00079-01-6	TRICHLOROETHYLENE	1	0.01748770	153.19260
00127-18-4	TETRACHLOROETHYLENE	1	0.00664710	58.22854
00156-59-2	DICHLOROETHYLENE,cis	1	0.00101400	8.88232

****

SUMMARY TOTALS	0.02611270	228.747150

EMISSION POINT AND CONTAMINANT IMPACT SUMMARY OF DAR-1 ANALYSIS

LOC	FAC	E.P.	CAS NUMBER	EMISSIONS #/HOUR	EMISSIONS #/YEAR	ANNUAL EMISSIONS #/HOUR	SHORT-TERM IMPACT MAXIMUM (Cav,Pt,Area) ug/m3	CAVITY IMPACT ACTUAL ANNUAL ug/m3	POINT or AREA SOURCE IMPACT POTENTIAL ANNUAL ug/m3	POINT or AREA SOURCE IMPACT ACTUAL ANNUAL ug/m3
			00156-59-2	0.001014	8.8823	0.001014	0.699020	0.000000	0.023786	0.023813
			00075-71-8	0.000964	8.4437	0.000964	0.664501	0.000000	0.022611	0.022637
			00079-01-6	0.017488	153.1926	0.017488	12.055940	0.000000	0.410233	0.410702
			00127-18-4	0.006647	58.2285	0.006647	4.582463	0.000000	0.155930	0.156108
SUMMARY TOTALS				0.026113	228.7471	0.026113	18.001923	0.000000	0.612560	0.613261

EMISSION POINT AND CONTAMINANT ASSESSMENT OF DAR-1 ANALYSIS

LOC	FAC	E.P.	CAS NUMBER	AGC ug/m3	SGC ug/m3	SHORT-TERM IMPACT MAXIMUM (Cav,Pt,Area) % OF SGC	CAVITY IMPACT ACTUAL ANNUAL % OF AGC	POINT or AREA SOURCE IMPACT POTENTIAL ANNUAL % OF AGC	POINT or AREA SOURCE IMPACT ACTUAL ANNUAL % OF AGC
			00156-59-2	63.000000000	0.0000	0.0000	0.0000	0.0378	0.0378
			00075-71-8	12000.000000000	0.0000	0.0000	0.0000	0.0002	0.0002
			00079-01-6	0.500000000	14000.0000	0.0861	0.0000	82.0467	82.1405
			00127-18-4	1.000000000	1000.0000	0.4582	0.0000	15.5930	15.6108
SUMMARY TOTALS						0.5444	0.0000	97.6776	97.7892

CONTAMINANT IMPACT SUMMARY OF DAR-1 ANALYSIS

CAS NUMBER	EMISSIONS #/HOUR	EMISSIONS #/YEAR	ANNUAL EMISSIONS #/HOUR	SUMMATION OF SHORT-TERM IMPACTS, MAXIMUM (Cav,Pt,Area) ug/m3	SUMMATION OF CAVITY IMPACTS ACTUAL ANNUAL ug/m3	SUMMATION OF POINT or AREA SOURCE IMPACTS POTENTIAL ANNUAL ug/m3	ACTUAL ANNUAL ug/m3
00075-71-8	0.000964	8.4437	0.000964	0.664501	0.000000	0.022611	0.022637
00079-01-6	0.017488	153.1926	0.017488	12.055940	0.000000	0.410233	0.410702
00127-18-4	0.006647	58.2285	0.006647	4.582463	0.000000	0.155930	0.156108
00156-59-2	0.001014	8.8823	0.001014	0.699020	0.000000	0.023786	0.023813
SUMMARY TOTALS	0.026113	228.7472	0.026113	18.001923	0.000000	0.612560	0.613261

CONTAMINANT ASSESSMENT SUMMARY OF DAR-1 ANALYSIS

CAS NUMBER	AGC ug/m3	SGC ug/m3	SUMMATION OF SHORT-TERM IMPACTS, MAXIMUM (Cav,Pt,Area) % OF SGC	SUMMATION OF CAVITY IMPACTS ACTUAL ANNUAL % OF AGC	SUMMATION OF POINT or AREA SOURCE IMPACTS POTENTIAL ANNUAL % OF AGC	ACTUAL ANNUAL % OF AGC
00075-71-8	12000.000000000	0.0000	0.0000	0.0000	0.0002	0.0002
00079-01-6	0.500000000	14000.0000	0.0861	0.0000	82.0467	82.1405
00127-18-4	1.000000000	1000.0000	0.4582	0.0000	15.5930	15.6108
00156-59-2	63.000000000	0.0000	0.0000	0.0000	0.0378	0.0378
SUMMARY TOTALS			0.5444	0.0000	97.6776	97.7892

Appendix D

Appendix D

Remedial Design Calculation for GWTF

Submersible Pump for EW-1S/1I/1D

Calculated by:	J. Ma	Date:	9/2/2009
Checked by:	G. Chen	Date:	9/4/2009

Purpose: Calculate the head requirement of the extraction pump and size the piping

Assumptions:

1. Design flow rate Q = 60 gpm
2. Pump EW-1S will be positioned 3 feet above the well screen, at L1= 214 feet bgs
3. Distance from the well vault to equalization tank L2= 2,000 feet

TDH = $h_z + h_f + h_v + h_p$

where:
- h_z = Elevation head (ft)
- h_f = Head loss from friction (ft)
- h_v = Velocity head (ft)
- h_p = Pressure head (ft)

1. Calculate elevation head : h_z

for EW-1S:

Ground elevation:	85	ft msl	at treatment facility, estimated from site plan
Water table	42.37	ft msl	minimum water level predicted by gw model
Depth to water table:	42.63	ft	
Drawdown based on an 80% well efficiency:	3.78	ft	using minimum water levels predicted by gw models for non-pumping and pumping conditions of EW-1S/11/1D, respectively.
Height of equalization tank	12.00	ft	at treatment facility
Total elevation head for EW-1S	**58.41**	ft	

2. Calculate Total Friction Loss:

$h_f = h_{f\,(pipe)} + h_{f\,(fittings)}$

2a. Calculate head loss from pipe friction within EW-1S: hf (pipe1)

Velocity (V) for Schedule 80 3-inch steel pipe : 2.92 ft/sec

From pump intake of Extraction well to wellhead (through 3" pipe)

$h_{f\,(pipe1)} = fLv^2/2Dg$

where:

f = friction factor	0.02317	from moody's
υ = kinematic viscosity (ft²/sec) =	1.217E-05	at 60°F for water
ϵ = specific roughness (ft) =	0.0002	for steel
L = Length of pipe (ft)	214	L1
v = velocity (ft/s)	2.92	
D = diameter of pipe (ft)	0.24	(3 in nominal dia.)
g = gravity (ft/s²)	32.2	
Re = D*v/υ	5.79E+04	

$h_{f\,(pipe1)}$ (ft) =	**2.71**

2b. Calculate head loss from pipe friction for yard piping: $h_{f\,(pipe2)}$

Velocity (V) for Schedule 80 6-inch HDPE pipe: 2.46 ft/sec

From EW-1S wellhead to influent header (through 6" pipe)

$h_{f\,(pipe2)} = fLv^2/2Dg$

where:

f = friction factor	0.01803	from moody's
υ = kinematic viscosity (ft²/sec) =	1.217E-05	at 60°F for water
ϵ = specific roughness (ft) =	0.000005	for plastic
L = Length of pipe (ft)	2,000	L2
v = velocity (ft/s)	2.46	
D = diameter of pipe (ft)	0.48	(6 in nonminal dia.)
g = gravity (ft/s²)	32.2	
Re = D*v/υ	9.72E+04	

$h_{f\,(pipe2)}$ (ft) =	**7.08**

2c. Calculate head loss from friction of fittings : $h_{f\ (fitting)}$

For fittings use, equivalent length method for a 3" dia. steel pipe. (see attached)

	eq.length (ft)	quantity	
check valve	27	1	27
regular 90° elbows	11	3	33
motorized globe valve	79	1	79
standard-tee	17	1	17
Y Strainer	34	1	34
3-inch to 2.5-inch reducer	11	2	22
ball valves	1.9	1	1.9
			213.9 ft

$h_{f\ (fitting)} = fL_{eq}v^2/2Dg$

where:

f = friction factor	0.02317
L_{eq} = Eq. Length of pipe (ft)	213.9
v = velocity (ft/s)	2.92
D = diameter of pipe (ft)	0.24
g = gravity (ft/s²)	32.2

$h_{f\ (fitting)}$ (ft) =	**2.71**

3. Calculate head loss due to velocity: $h_{v\ (velocity)}$

$h_{v\ (velocity)} = v^2/2g$

where:

v = velocity (ft/s)	2.46
g = gravity (ft/s²)	32.2

h_v (ft) =	**0.09**

4. Calculate head loss due to change in pressure thru units: $h_{p\ (pressure)}$

Pressure loss through Flow Meter:

$h_{p\ (pressure)}$ =	1.5	psi
	3.465	ft

5. Total Head Required of the pump

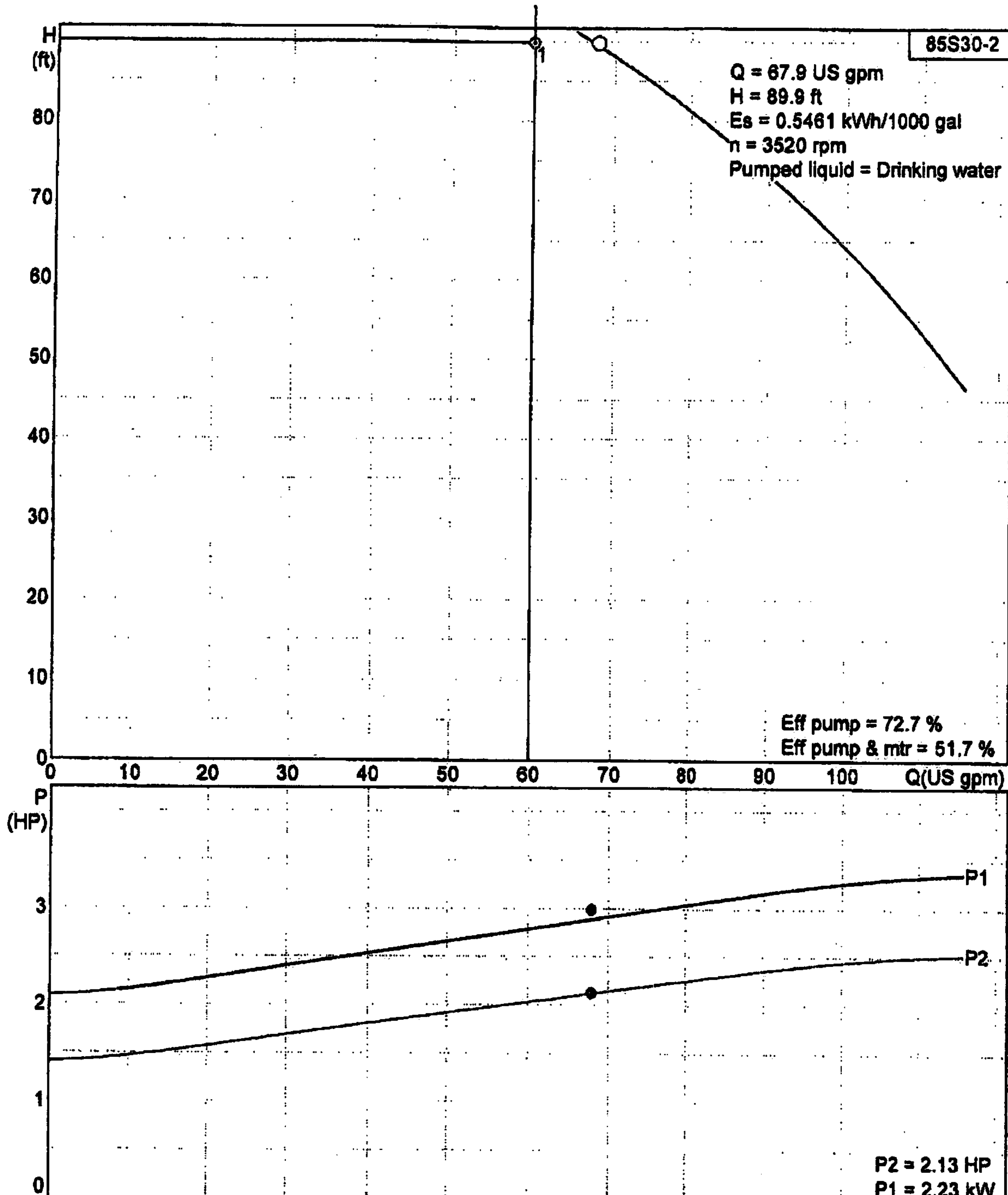
TDH (ft) =	**74.46**	increase by 20% as a safety factor
TDH (ft) =	**89.35**	

Pumps sized to meet:
Grundfos 85S30-2
3 HP

GRUNDFOS

Company name: -
Created by: -
Phone: -
Fax: -
Date: -

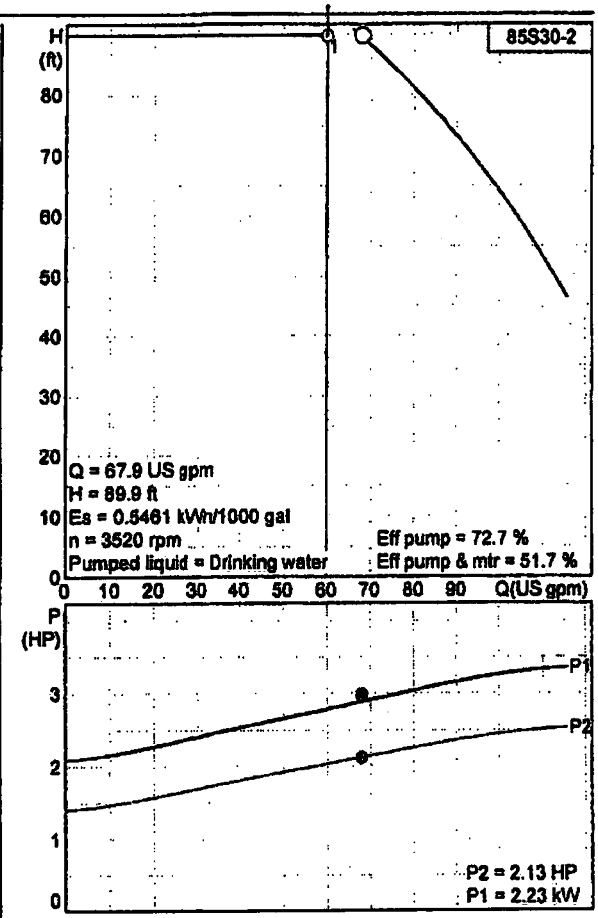
12B63602 85S30-2



GRUNDFOS

Company name: -
Created by: -
Phone: -
Fax: -
Date: -

Description	Value
Product name:	85S30-2
Product No.:	12B63602
EAN:	5700391310638
Technical:	
Speed for pump data:	3450 rpm
Actual calculated flow:	68 US gpm
Flow range:	7.04 .. 118 US gpm
Max flow:	118 US gpm
Resulting head of the pump:	89.9 ft
Shaft seal for motor:	HM/CER
Approvals on nameplate:	CE,GOST2,CSA
Curve tolerance:	ISO 9906 Annex A
Pump Number:	12B60002
Stages:	2
Model:	A
Valve:	pump with built-in non-return valve
Materials:	
Pump:	Stainless steel 1.4301 DIN W.-Nr. 304 AISI
Impeller:	Stainless steel 1.4301 DIN W.-Nr. 304 AISI
Motor:	Stainless steel 1.4301 DIN W.-Nr. 304 AISI
Installation:	
Maximum ambient pressure:	870 psi
Min inlet pressure:	-6.6 psi
Pump outlet:	3" NPT
Motor diameter:	4 inch
Minimum borehole diameter:	6" mm
Liquid:	
Pumped liquid:	Drinking water
Density:	62.4 lb/ft³
Electrical data:	
Motor type:	MS4000
Applic. motor:	NEMA
Rated power - P2:	3 HP
KVA code:	H
Main frequency:	60 Hz
Rated voltage:	3 x 440-480 V
Start. method:	direct-on-line
Starter:	0
Service factor:	1,15
Rated current:	5,65-5,80 A
I MAX:	6.1 A
Starting current:	28 A
Cos phi - power factor:	0,80-0,75
Rated speed:	3440-3460 rpm
Axial load max:	992 lb
Motor efficiency at full load:	77,0 %
Enclosure class (IEC 34-5):	58
Insulation class (IEC 85):	F
Motor protection:	NONE
Thermal protec:	external



GRUNDFOS

Company name: -
Created by: -
Phone: -
Fax: -
Date: -

Description	Value
Built-in temperature transmitter:	No
Motor Number:	79354507
Controls:	
Heather:	K37
Others:	
Sales region:	Namreg

		Company name: -
GRUNDFOS		Created by: -
		Phone: -
		Fax: -
		Date: -

12B63602 85S30-2

Input

Select Application

	Groundwater supply
Overview mode	No

Select Type of Installation

	Well installation, open tank
Installation Type	Bore hole

Your Requirements

Allowed flow oversize	30 %
Allowed flow undersize	0 %
Flow	60 US gpm
Head	89.75 ft
Operating hours per day (low)	10 h
Speed regulation	No

Configuration

Motor selection	Grundfos standard motor
Pump material	GG 0.6025 or 1.4301 (AISI 304)

Operational Conditions

Calculation period	15 years
Energy price (high)	0.20 $/kWh
Energy price (low)	0.07 $/kWh
Energy price (medium)	0.12 $/kWh
Evaluation criterion	Electricity consumption
Frequency	60 Hz
Increase of energy price	6 %
Phase	3
Starting method 3-phase	DOL
Voltage	460 V

Hit list settings

Maximum number of results	20
Pumps per product group	1

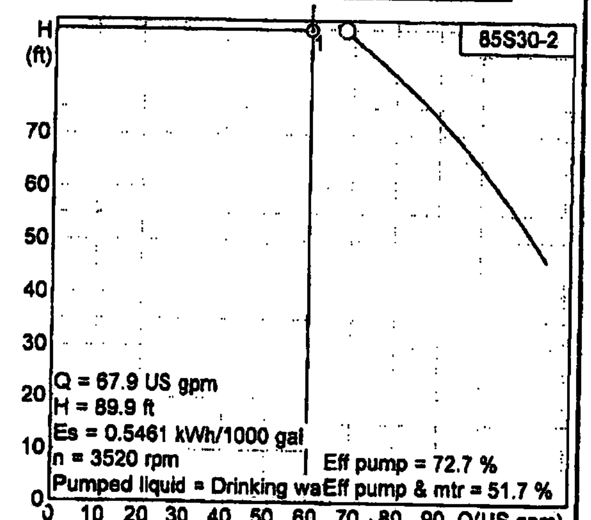
Load profile

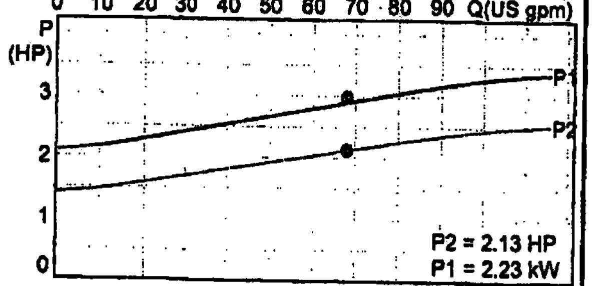
	1	
Flow	100	%
Head	100	%
Time	10	h/Year
Consumption	20	kWh/Year

Sizing result

Type	85S30-2	
Quantity * Motor	1 * 3 HP , 440-460 V	
Flow	68	US gpm (+14 %)
H total	89.9	ft
Power P1	2.23	kW
Power P2	2.13	HP
Current (rated)	6.1	A
Current (actual)	5.05	A
Cos phi (actual)	0.55	
Eff pump	72.7	%
Eff motor	71.2	%
Eff total	51.7	% =Eta pump * Eta motor
Flow total	35931.2	gal/year
Spec. consumpt.	0.5486	kWh/1000 gal
	4.67	kWh/gal/ft
Consumption	20	kWh/Year
Price	$ On request	
Energy cost	$ 1	/Year
Total costs	$ On request	/15Years

Warning: High motor temperature! Select cooling jacket or oversized motor/industrial motor.





Calculated by:	J. Ma	Date:	9/2/2009
Checked by:	G. Chen	Date:	9/4/2009

Purpose: Calculate the head requirement of the extraction pump and size the piping

Assumptions:

1. Design flow rate Q = 60 gpm
2. Pump EW-1I will be positioned 3 feet above the well, at L1= 284 feet bgs
3. Distance from the well vault to equalization tank L2= 2,000 feet

$TDH = h_z + h_f + h_v + h_p$

where:
h_z = Elevation head (ft)
h_f = Head loss from friction (ft)
h_v = Velocity head (ft)
h_p = Pressure head (ft)

1. Calculate elevation head : h_z

for EW-1I:

Ground elevation:	85	ft msl	at treatment facility, estimated from site plan
Water table	40.58	ft msl	minimum water level predicted by gw model
Depth to water table:	44.42	ft	
			using minimum water levels predicted by gw models for non-pumping and pumping conditions
Drawdown based on an 80% well efficiency:	4.70	ft	of EW-1S/1I/1D, respectively.
Height of equalization tank	12.00	ft	at treatment facility
Total elevation head for EW-1I	61.12	ft	

2. Calculate Total Friction Loss:

$h_f = h_{f\ (pipe)} + h_{f\ (fittings)}$

2a. Calculate head loss from pipe friction within EW-1I: hf (pipe1)

Velocity (V) for Schedule 80 3-inch steel pipe : 2.92 ft/sec

From pump intake of Extraction well to wellhead (through 3" pipe)

$h_{f\ (pipe1)} = fLv^2/2Dg$

where:

f = friction factor	0.02317	from moody's
υ = kinematic viscosity (ft^2/sec) =	1.217E-05	at 60°F for water
ϵ = specific roughness (ft) =	0.0002	for steel
L = Length of pipe (ft)	284	L1
v = velocity (ft/s)	2.92	
D = diameter of pipe (ft)	0.24	(3 in nominal dia.)
g = gravity (ft/s^2)	32.2	
Re = D*v/υ	5.79E+04	

$h_{f\ (pipe1)}$ (ft) =	3.60

2b. Calculate head loss from pipe friction for yard piping: $h_{f\ (pipe2)}$

Velocity (V) for Schedule 80 6-inch HDPE pipe: 2.46 ft/sec

From EW-1I wellhead to influent header (through 6" pipe)

$h_{f\ (pipe2)} = fLv^2/2Dg$

where:

f = friction factor	0.01803	from moody's
υ = kinematic viscosity (ft^2/sec) =	1.217E-05	at 60°F for water
ϵ = specific roughness (ft) =	0.000005	for plastic
L = Length of pipe (ft)	2,000	L2
v = velocity (ft/s)	2.46	
D = diameter of pipe (ft)	0.48	(6 in nonminal dia.)
g = gravity (ft/s^2)	32.2	
Re = D*v/υ	9.72E+04	

$h_{f\ (pipe2)}$ (ft) =	7.08

2c. Calculate head loss from friction of fittings : $h_{f\,(fitting)}$

For fittings use, equivalent length method for a 3" dia. steel pipe. (see attached)

	eq.length (ft)	quantity	
check valve	27	1	27
regular 90° elbows	11	3	33
motorized globe valve	79	1	79
standard-tee	17	1	17
Y Strainer	34	1	34
3-inch to 2.5-inch reducer	11	2	22
ball valves	1.9	1	1.9
			213.9 ft

$h_{f\,(fitting)} = fL_{eq}v^2/2Dg$

where:

f = friction factor	0.02317
L_{eq} = Eq. Length of pipe (ft)	213.9
v = velocity (ft/s)	2.92
D = diameter of pipe (ft)	0.24
g = gravity (ft/s²)	32.2

$h_{f\,(fitting)}$ (ft) =	**2.71**

3. Calculate head loss due to velocity: $h_{v\,(velocity)}$

$h_{v\,(velocity)} = v^2/2g$

where:

v = velocity (ft/s)	2.46
g = gravity (ft/s²)	32.2

h_v (ft) =	**0.09**

4. Calculate head loss due to change in pressure thru units: $h_{p\,(pressure)}$

Pressure loss through Flow Meter:

$h_{p\,(pressure)}$ = 1.5 psi

3.465 ft

5. Total Head Required of the pump

TDH (ft) = 78.06 increase by 20% as a safety factor

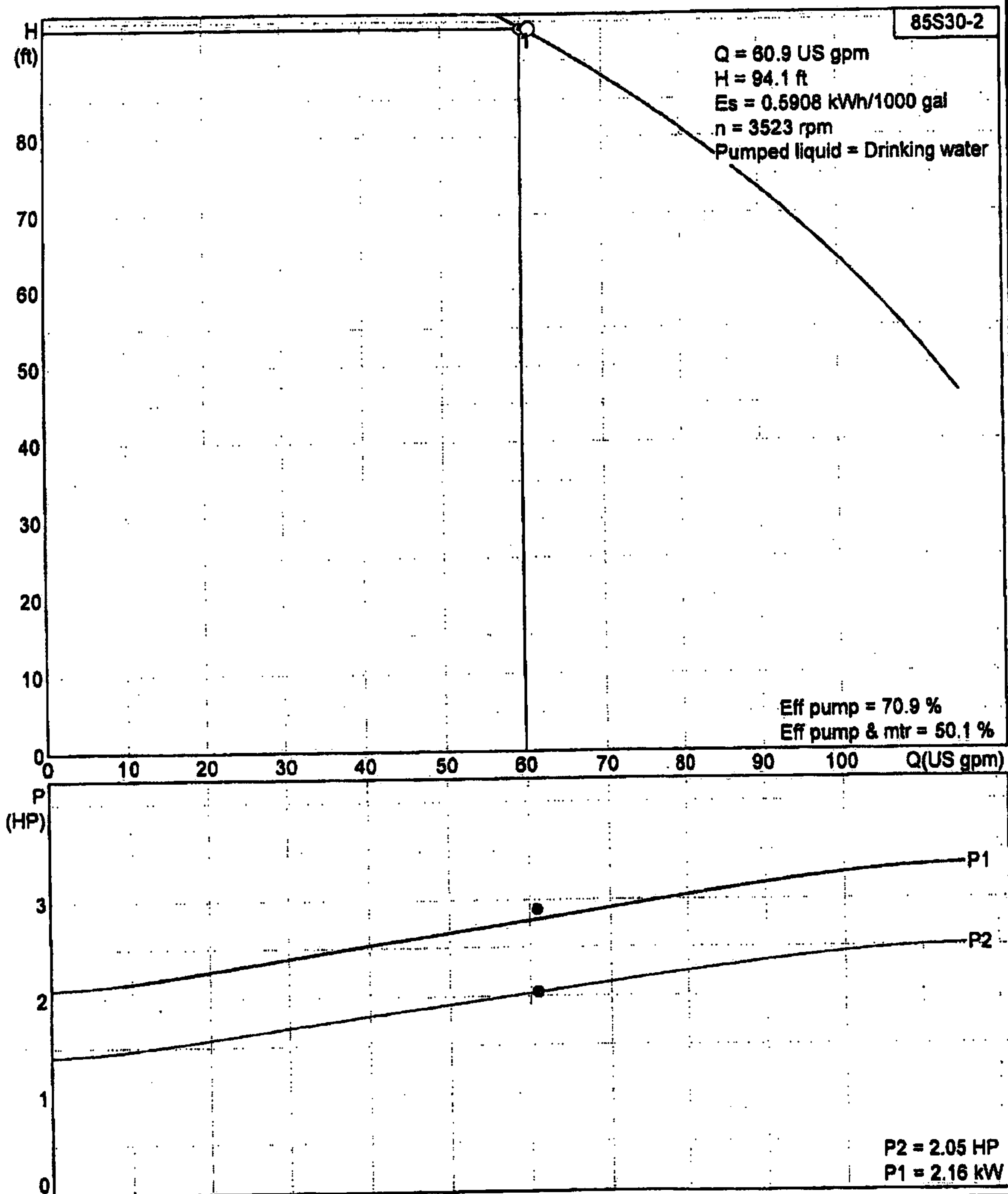
TDH (ft) = 93.67

Pumps sized to meet:
Grundfos 85S30-2
3 HP

GRUNDFOS

Company name: -
Created by: -
Phone: -
Fax: -
Date: -

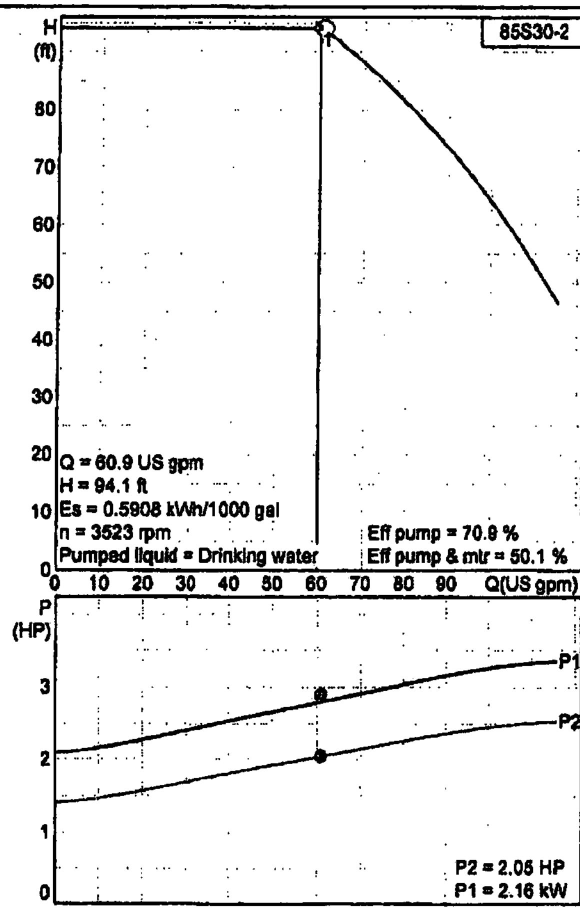
12B63602 85S30-2



GRUNDFOS

Company name: -
Created by: -
Phone: -
Fax: -
Date: -

Description	Value
Product name:	85S30-2
Product No.:	12B63502
EAN:	5700391310638
Technical:	
Speed for pump data:	3450 rpm
Actual calculated flow:	61 US gpm
Flow range:	7.04 .. 118 US gpm
Max flow:	118 US gpm
Resulting head of the pump:	94.2 ft
Shaft seal for motor:	HM/CER
Approvals on nameplate:	CE,GOST2,CSA
Curve tolerance:	ISO 9906 Annex A
Pump Number:	12B60002
Stages:	2
Model:	A
Valve:	pump with built-in non-return valve
Materials:	
Pump:	Stainless steel 1.4301 DIN W.-Nr. 304 AISI
Impeller:	Stainless steel 1.4301 DIN W.-Nr. 304 AISI
Motor:	Stainless steel 1.4301 DIN W.-Nr. 304 AISI
Installation:	
Maximum ambient pressure:	870 psi
Min inlet pressure:	-6.8 psi
Pump outlet:	3" NPT
Motor diameter:	4 inch
Minimum borehole diameter:	6" mm
Liquid:	
Pumped liquid:	Drinking water
Electrical data:	
Motor type:	MS4000
Applic. motor:	NEMA
Rated power - P2:	3 HP
KVA code:	H
Main frequency:	60 Hz
Rated voltage:	3 x 440-460 V
Start. method:	direct-on-line
Starter:	0
Service factor:	1,15
Rated current:	5,65-5,80 A
I MAX:	6.1 A
Starting current:	28 A
Cos phi - power factor:	0,80-0,75
Rated speed:	3440-3460 rpm
Axial load max:	992 lb
Motor efficiency at full load:	77,0 %
Enclosure class (IEC 34-5):	58
Insulation class (IEC 85):	F
Motor protection:	NONE
Thermal protec:	external
Built-in temperature transmitter:	No



GRUNDFOS

Company name: -
Created by: -
Phone: -
Fax: -
Date: -

Description	Value
Motor Number:	79354507
Controls:	
Heather:	K37
Others:	
Sales region:	Namreg

GRUNDFOS	**Company name:** -
	Created by: -
	Phone: -
	Fax: -
	Date: -

12B63602 85S30-2

Input

Select Application	
	Groundwater supply
Overview mode	No
Select Type of Installation	
	Well installation, open tank
Installation Type	Bore hole
Your Requirements	
Allowed flow oversize	30 %
Allowed flow undersize	0 %
Flow	60 US gpm
Head	94.07 ft
Operating hours per day (low)	10 h
Speed regulation	No
Configuration	
Motor selection	Grundfos standard motor
Pump material	GG 0.6025 or 1.4301 (AISI 304)
Operational Conditions	
Calculation period	15 years
Energy price (high)	0.20 $/kWh
Energy price (low)	0.07 $/kWh
Energy price (medium)	0.12 $/kWh
Evaluation criterion	Electricity consumption
Frequency	60 Hz
Increase of energy price	6 %
Phase	3
Starting method 3-phase	DOL
Voltage	460 V
Hit list settings	
Maximum number of results	20
Pumps per product group	1

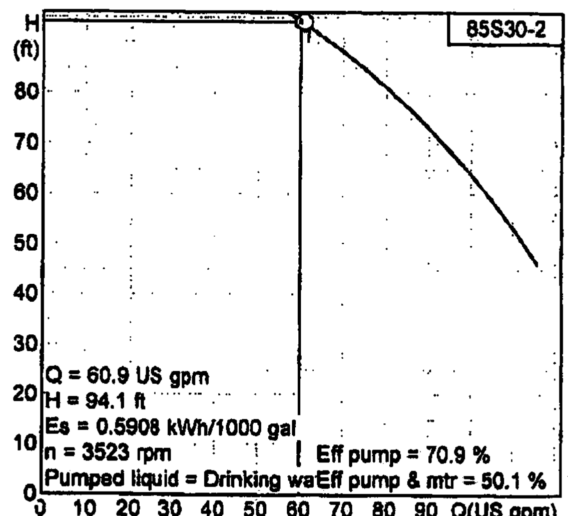
Load profile

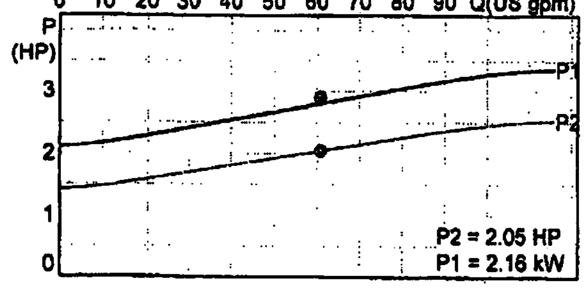
	1	
Flow	100	%
Head	100	%
Time	10	h/Year
Consumption	21	kWh/Year

Sizing result

Type	85S30-2	
Quantity * Motor	1 * 3 HP , 440-460 V	
Flow	61	US gpm (+2 %)
H total	94.2	ft
Power P1	2.16	kW
Power P2	2.05	HP
Current (rated)	6.1	A
Current (actual)	5.01	A
Cos phi (actual)	0.54	
Eff pump	70.9	%
Eff motor	70.7	%
Eff total	50.1	% =Eta pump * Eta motor
Flow total	35931.2	gal/year
Spec. consumpt.	0.592	kWh/1000 gal
	4.82	kWh/gal/ft
Consumption	21	kWh/Year
Price	$ On request	
Energy cost	$ 1	/Year
Total costs	$ On request	/15Years

Warning: High motor temperature! Select cooling jacket or oversized motor/industrial motor.





Calculated by:	J. Ma	Date:	9/2/2009
Checked by:	G. Chen	Date:	9/4/2009

Purpose: Calculate the head requirement of the extraction pump and size the piping

Assumptions:
1. Design flow rate Q = 130 gpm
2. Pump EW-1D will be positioned 3 feet above the well screen, at L1= 354 feet bgs
3. Distance from the well vault to equalization tank L2= 2,000 feet

TDH = $h_z + h_f + h_v + h_p$

where: h_z = Elevation head (ft)
h_f = Head loss from friction (ft)
h_v = Velocity head (ft)
h_p = Pressure head (ft)

1. Calculate elevation head : h_z

for EW-1D:

Ground elevation:	85	ft msl	at treatment facility, estimated from site plan
Water table	38.71	ft msl	minimum water level predicted by gw model
Depth to water table:	46.29	ft	
			using minimum water levels predicted by gw models for non-pumping and pumping conditions of EW-1S/1I/1D, respectively.
Drawdown based on an 80% well efficiency:	5.36	ft	
Height of equalization tank	12.00	ft	at treatment facility
Total elevation head for EW-1D	**63.65**	ft	

2. Calculate Total Friction Loss:

$h_f = h_{f\,(pipe)} + h_{f\,(fittings)}$

2a. Calculate head loss from pipe friction within EW-1D: hf (pipe1)

Velocity (V) for Schedule 80 3-inch steel pipe : 6.32 ft/sec
From pump intake of Extraction well to wellhead (through 3" pipe)

$h_{f\,(pipe1)} = fLv^2/2Dg$

where:

f = friction factor	0.02128	from moody's
υ = kinematic viscosity (ft²/sec) =	1.217E-05	at 60°F for water
ϵ = specific roughness (ft) =	0.0002	for steel
L = Length of pipe (ft)	354	L1
v = velocity (ft/s)	6.32	
D = diameter of pipe (ft)	0.24	(3 in nominal dia.)
g = gravity (ft/s²)	32.2	
Re = D*v/υ	1.25E+05	

$h_{f\,(pipe1)}$ (ft) = **19.32**

2b. Calculate head loss from pipe friction for yard piping: $h_{f\,(pipe2)}$

Velocity (V) for Schedule 80 6-inch HDPE pipe: 3.08 ft/sec
From EW-1D wellhead to influent header (through 6" pipe)

$h_{f\,(pipe2)} = fLv^2/2Dg$

where:

f = friction factor	0.01722	from moody's
υ = kinematic viscosity (ft²/sec) =	1.217E-05	at 60°F for water
ϵ = specific roughness (ft) =	0.000005	for plastic
L = Length of pipe (ft)	2,000	L2
v = velocity (ft/s)	3.08	
D = diameter of pipe (ft)	0.48	(6 in nonminal dia.)
g = gravity (ft/s²)	32.2	
Re = D*v/υ	1.21E+05	

$h_{f\,(pipe2)}$ (ft) = **10.56**

2c. Calculate head loss from friction of fittings : $h_{f\,(fitting)}$

For fittings use, equivalent length method for a 3" dia. steel pipe. (see attached)

	eq.length (ft)	quantity	
check valve	27	1	27
regular 90° elbows	11	3	33
motorized globe valve	79	1	79
standard-tee	17	1	17
Y Strainer	34	1	34
3-inch to 2.5-inch reducer	11	2	22
ball valves	1.9	1	1.9
			213.9 ft

$h_{f\,(fitting)} = fL_{eq}v^2/2Dg$

where:

f = friction factor	0.02128
L_{eq} = Eq. Length of pipe (ft)	213.9
v = velocity (ft/s)	6.32
D = diameter of pipe (ft)	0.24
g = gravity (ft/s²)	32.2

$h_{f\,(fitting)}$ (ft) =	**11.68**

3. Calculate head loss due to velocity: $h_{v\,(velocity)}$

$h_{v\,(velocity)} = v^2/2g$

where:

v = velocity (ft/s)	3.08
g = gravity (ft/s²)	32.2

h_v (ft) =	**0.15**

4. Calculate head loss due to change in pressure thru units: $h_{p\,(pressure)}$

Pressure loss through Flow Meter:

$h_{p\,(pressure)}$ = 1.5 psi
3.465 ft

5. Total Head Required of the pump

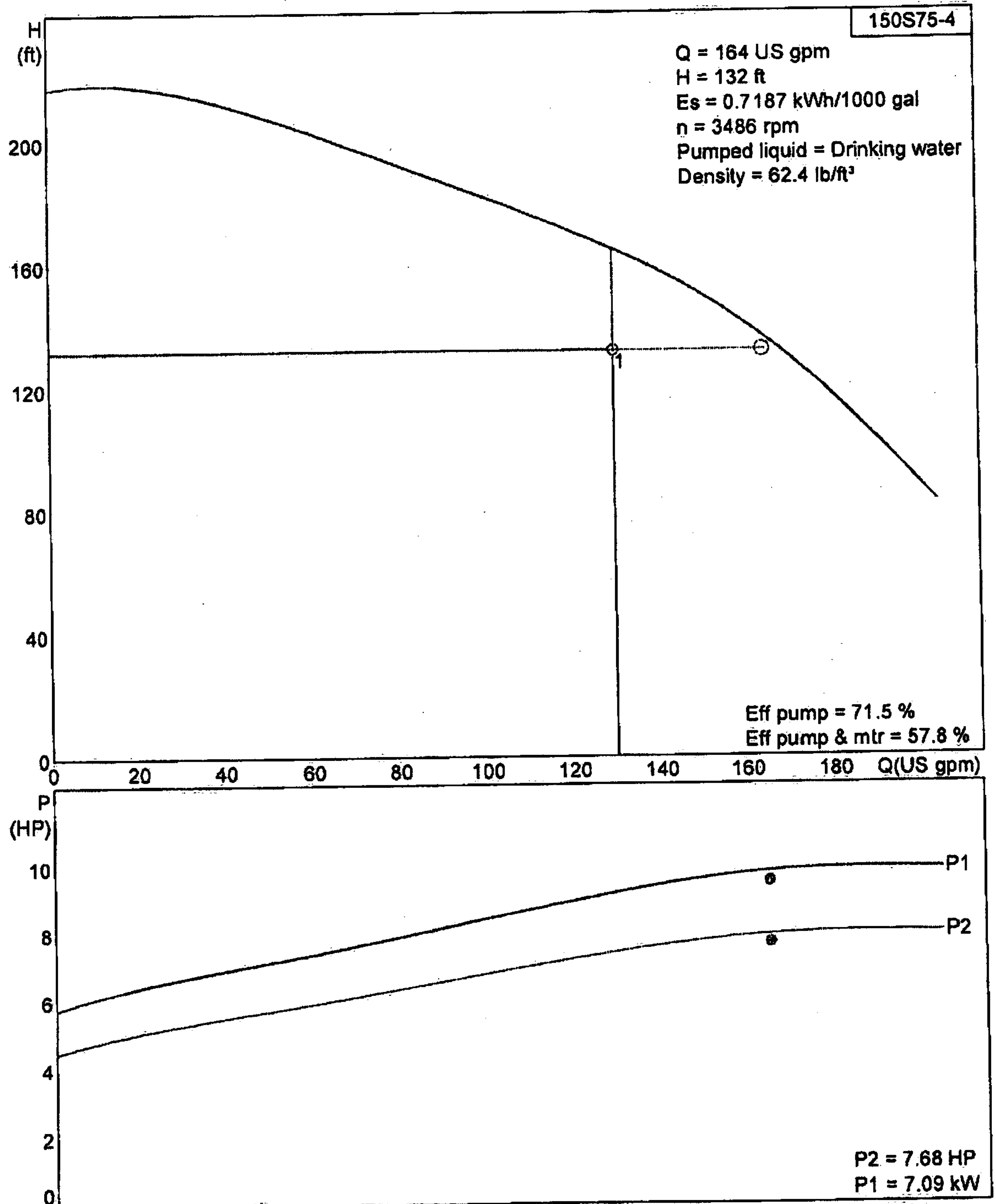
TDH (ft) =	**108.83**	increase by 20% as a safety factor
TDH (ft) =	**130.59**	

Pumps sized to meet:
Grundfos 150S75-4
7.5 HP

GRUNDFOS

Company name: -
Created by: -
Phone: -
Fax: -
Date: -

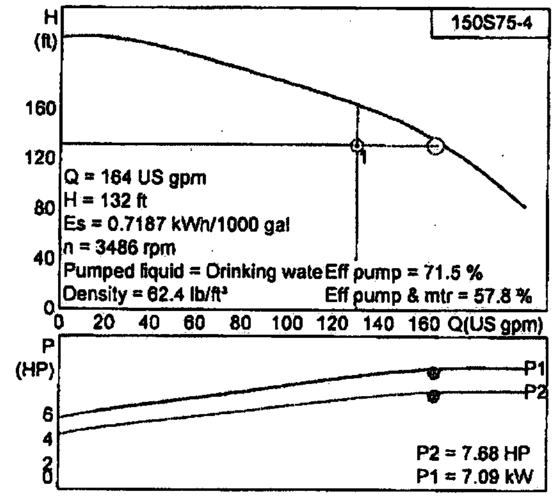
13BG3604 150S75-4 60 Hz

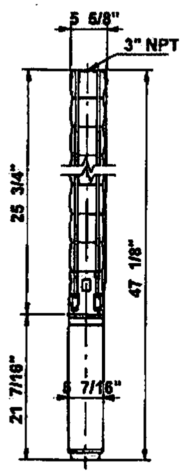


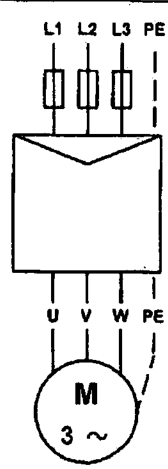
GRUNDFOS

Company name: -
Created by: -
Phone: -
Fax: -
Date: -

Description	Value
Product name:	150S75-4
Product No.:	13BG3604
EAN:	5700391433849
Technical:	
Speed for pump data:	3450 rpm
Actual calculated flow:	164 US gpm
Flow range:	20 .. 210 US gpm
Max flow:	210 US gpm
Resulting head of the pump:	132 ft
Shaft seal for motor:	CER/CARBON
Approvals on nameplate:	CE,GOST2,CSA
Curve tolerance:	ISO 9906 Annex A
Pump Number:	13BG0004
Stages:	4
Model:	A
Valve:	pump with built-in non-return valve
Materials:	
Pump:	Stainless steel DIN W.-Nr. 1.4301 AISI 304
Impeller:	Stainless steel DIN W.-Nr. 1.4301 AISI 304
Motor:	Stainless steel DIN W.-Nr. 1.4301 AISI 304
Installation:	
Maximum ambient pressure:	870 psi
Min inlet pressure:	-7.1 psi
Pump outlet:	3" NPT
Motor diameter:	6 inch
Minimum borehole diameter:	6" mm
Liquid:	
Pumped liquid:	Drinking water
Max liquid temperature at 0.15 m/sec:	86 °F
Electrical data:	
Motor type:	MS6000
Applic. motor:	NEMA
Rated power - P2:	7.5 HP
KVA code:	G
Main frequency:	60 Hz
Rated voltage:	3 x 440-460 V
Start. method:	direct-on-line
Starter:	1
Service factor:	1,15
Rated current:	13,2-13,2 A
I MAX:	13.2 A
Starting current:	59 A
Cos phi - power factor:	0,82-0,79
Rated speed:	3450-3460 rpm
Axial load max:	992 lb
Motor efficiency at full load:	80,5 %
Enclosure class (IEC 34-5):	58
Insulation class (IEC 85):	F
Motor protection:	NONE







Company name:	-
Created by:	-
Phone:	-
Fax:	-
Date:	-

Description	Value
Thermal protec:	external
Built-in temperature transmitter:	yes
Motor Number:	78355511
Controls:	
Heather:	K56
Others:	
Sales region:	Namreg

Company name: -
Created by: -
Phone: -
Fax: -
Date: -

13BG3604 150S75-4 60 Hz

Input

Select Application

	Groundwater supply
Overview mode	No

Select Type of Installation

	Well installation, closed tank
Installation Type	Bore hole

Your Requirements

Allowed flow oversize	30 %
Allowed flow undersize	0 %
Flow	130 US gpm
Head	132.3 ft
Operating hours per day (low)	10 h
Speed regulation	No

Configuration

Motor selection	Grundfos standard motor
Pump material	GG 0.6025 or 1.4301 (AISI 304)

Operational Conditions

Calculation period	15 years
Energy price (high)	0.20 $/kWh
Energy price (low)	0.07 $/kWh
Energy price (medium)	0.12 $/kWh
Evaluation criterion	Electricity consumption
Frequency	60 Hz
Increase of energy price	6 %
Phase	3
Starting method 3-phase	DOL
Voltage	460 V

Hit list settings

Maximum number of results	20
Pumps per product proup	1

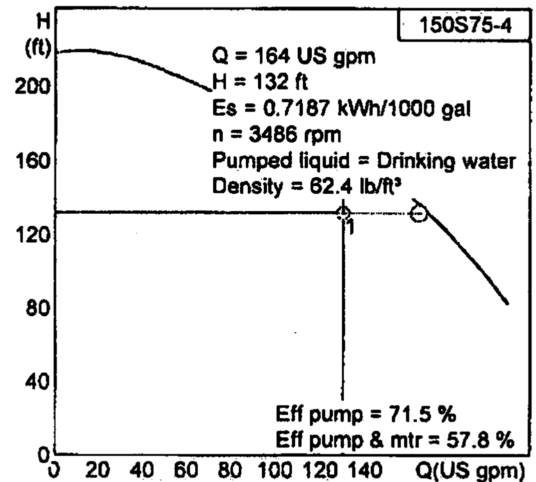
Load profile

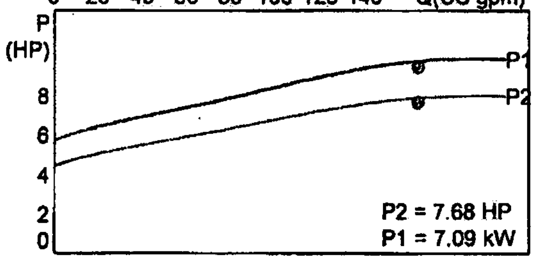
	1	
Flow	100	%
Head	100	%
Time	10	h/Year
Consumption	67	kWh/Year

Sizing result

Type	150S75-4	
Quantity * Motor	1 * 7.5 HP , 440-460 V	
Flow	164	US gpm (+27 %)
H total	132	ft
Power P1	7.09	kW
Power P2	7.69	HP
Current (rated)	13.2	A
Current (actual)	11.9	A
Cos phi (actual)	0.75	
Eff pump	71.5	%
Eff motor	80.9	%
Eff total	57.8	% =Eta pump * Eta motor
Flow total	77939	gal/year
Spec. consumpt.	0.8572	kWh/1000 gal
	4.97	kWh/gal/ft
Consumption	67	kWh/Year
Price	$ On request	
Energy cost	$ 5	/Year
Total costs	$ On request	/15Years

Be aware that the flow is more than 20% above the requested duty point and this could influence the operation in a negative way.
Warning: High motor temperature! Select cooling jacket or oversized motor/industrial motor.



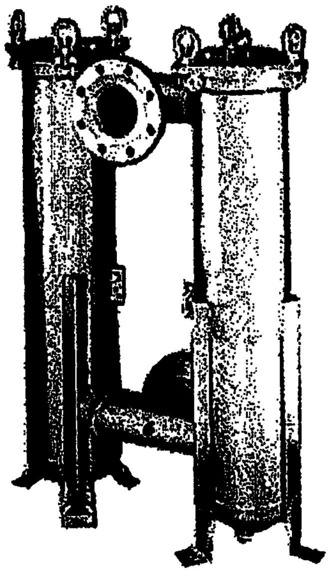


Bag Filters BF-1/BF-2

Dual Capacity Bag Filter And Basket Strainer

Extra capacity at higher flow rates!

Ecologix dual capacity housings can serve as either basket strainers or bag filters. Covers are easily removed, without tools, and the basket or bag is quickly and easily cleaned or replaced. Ecologix bag-sized pleated cartridges will provide even greater dirt-holding capacity (see pages 139-142). Low price, greater dirt holding capacity, and higher flow rates make the Model 82 a very cost-efficient choice!



Features

- Low pressure drops
- Permanently-piped housings
- Covers are O-ring sealed
- Carbon steel or stainless steel (304 or 316) housings
- Housings are electropolished to resist adhesion of dirt or scale
- Adjustable-height legs
- For flow rates to 440 gpm
- ASME code stamp available
- Large-area, heavy-duty baskets
- Dual stage straining/filtering

Options

- Higher pressure ratings
- Extra-length legs
- Heat jacketing
- Liquid displacers for easier servicing

Basket Data (each basket, two baskets total)

Depth inches (nominal)	Diameter (inches)	Surface Area (sq. ft.)	Volume (cu. in.)	Bag Size No.
15	6.7	2.3	500	1
30	6.7	4.4	1000	2

Model 82 Dual Capacity Filter Bag Housings

How To Order

Build an ordering code as shown in the example

	Housing	Options
Example:	82- 30- 4F- 1 -150- C - B	- S - BM- 200-D - C

MODEL 82 = 82

HOUSING SIZE
15 inch = 15
30 inch = 30

PIPE SIZE, NPT & FLANGED
2-in. 150 or 300-lb ANSI flange* = 2F
3-in. 150 or 300-lb ANSI flange* = 3F
4-in. 150 or 300-lb ANSI flange* = 4F
6-in. 150 or 300-lb ANSI flange* = 6F
*Dependent on required pressure rating

OUTLET STYLE
Side = 1

PRESSURE RATING
150 psi (flanged) = 150
300 psi (flanged) = 300

HOUSING MATERIAL
Carbon steel = C
304 stainless steel = S
316 stainless steel = S316

COVER SEAL
Buna N = B
Ethylene Propylene = E
Viton ®, Fluoroelastomer = V
Teflon ®, Encapsulated Viton® = TEV
Teflon ®(solid white) = TSW

BASKET SEAL
Seal (required) = S

BASKET TYPE
Filter bag basket [2] = PB
Strainer basket = P
Filter bag basket, mesh lined [2] = BM
Strainer basket, mesh liner = M
Filter bag basket, heavy wire mesh = HWM

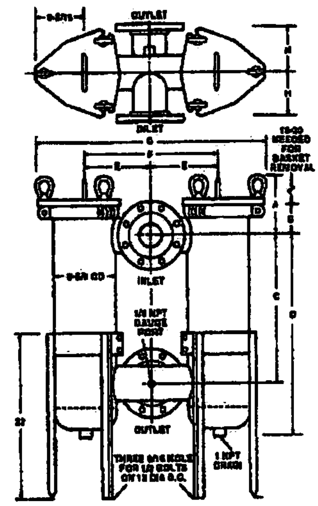
BASKET, MEDIA SIZE , no symbol if type B basket was selected
Type P perforation diameters 1/4, 3/16, 9/64, 3/32, 1/16
Type M and BM mesh sizes 20, 30, 40, 50, 60, 70, 80, 100, 150, 200 = 200

DISPLACER
Displacer = D

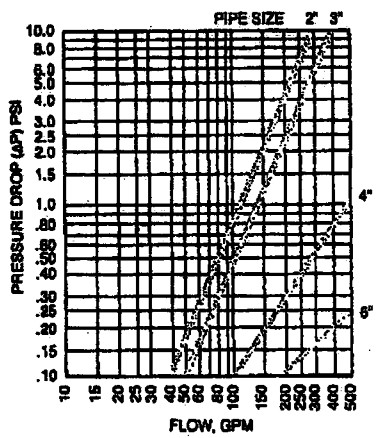
ASME CODE STAMP
Code = C

1. Higher pressures are available, consult factory.
2. Filter bags are specified separately. See pages 120-130.
3. Flanges provided with the housing match the pressure rating of the vessel. Housings rated 150 psi have 150 class flanges. Housings rated 300 psi have 300 class flanges.

Dimensions (IN)



Pipe Size	2	3	4	6
A	6-5/8	7-1/2	7-1/2	9
B	2-7/8	3-3/4	3-3/4	5-1/4
C (15 in)	14-1/2	14-1/2	14-1/2	14-1/2
(30 in)	29-1/2	29-1/2	29-1/2	29-1/2
D (15 in)	21-3/16	22-3/32	22-3/32	23-9/16
(30 in)	36-3/16	37-3/32	37-3/32	38-9/16
E	8	8	9	9
F	16	16	18	18
G	28-9/16	28-9/16	30-9/16	30-9/16
H	4-1/2	5-1/2	6-1/2	8



*Based on housing only. Fluid viscosity, filter bag used, and expected dirt loading should be considered when sizing a filter.

Air Stripper AS-1

CARBONAIR

STAT MODEL CALCULATIONS
VERSION 4.1

09/01/09
08:29:00

CARBONAIR ENVIRONMENTAL SYSTEMS
2731 NEVADA AVENUE NORTH, NEW HOPE, MN 55427
PHONE: 763-544-2154 FAX: 763-544-2151

UNIT MODEL:	STAT 400	WATER TEMPERATURE (F):	55.0
WATER FLOW RATE (GPM):	250.0	AIR TEMPERATURE (F):	55.0
AIR FLOW RATE (ACFM):	2100.0	AIR-TO-WATER RATIO:	63:1
OPERATING PRESS (ATM):	1.0	SAFETY FACTOR (%):	0.0

Influent Conc. for TRICHLOROETHENE 140.0 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	68.97339	43.4373	1.5327	0.2898
2	90.09216	13.8710	2.0020	0.3786
3	96.80753	4.4695	2.1513	0.4068
4	98.96837	1.4443	2.1993	0.4159
5	99.66632	0.4671	2.2148	0.4188
6	99.89204	0.1511	2.2198	0.4197

Influent Conc. for TETRACHLOROETHENE 53.0 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	69.75034	16.0323	0.5868	0.1110
2	90.67902	4.9401	0.7629	0.1442
3	97.11172	1.5308	0.8170	0.1545
4	99.10347	0.4752	0.8337	0.1576
5	99.72156	0.1476	0.8389	0.1586
6	99.91351	0.0458	0.8405	0.1589

Influent Conc. for TOTAL VOCs 193.0 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	69.18675	59.4696	2.1195	0.4008
2	90.25332	18.8111	2.7649	0.5228
3	96.89106	6.0003	2.9682	0.5612
4	99.00547	1.9194	3.0330	0.5735
5	99.68149	0.6147	3.0537	0.5774
6	99.89794	0.1970	3.0604	0.5787

CARBONAIR
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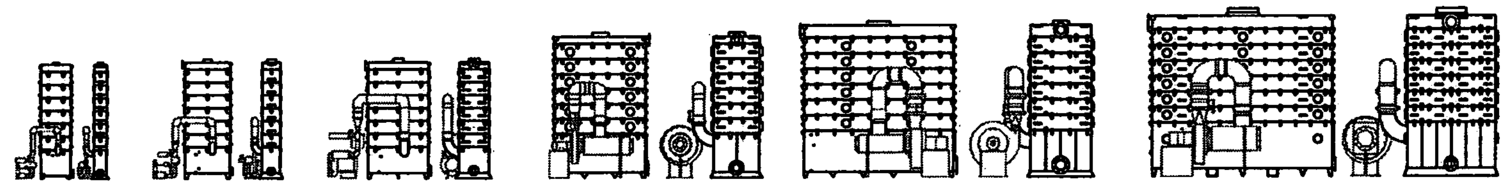
STAT® Series
Low Profile Air Strippers

Carbonair's exclusive STAT series represents the best choice in low profile air strippers, combining high performance, flexibility, and design simplicity. Carbonair's STAT units are available with a number of tray configurations, blowers and controls, and can achieve a removal efficiency of up to 99.99 % for a long list of volatile organic compounds.

Specifications[1]



Model	STAT 15	STAT 30	STAT 80	STAT 180	STAT 400	STAT 720
Liquid Flow Range (gpm)	0.5 - 12	1 - 35	5 - 80	10 - 200	20 - 400	40 - 1000
Minimum Airflow (cfm)	60	100	300	650	1800	3000
Maximum Airflow (cfm)	80	150	350	900	2100	4000
Blower HP [2]	1.0, 1.5	2, 3	5, 7.5, 10	10	20, 25	40, 50
Tray Dimensions (LxWxH, in)	24x10x10	36x14x10	48x24x10	72x36x11 5/8	120x48x12	144x72x12
Assembly Height (Approx.) [3]	7'-7 1/4"	7'-9 3/4"	7'-10 1/4"	9'-6"	10'-2 1/4"	10'-11 3/4"
Optional Skid Footprint (LxWxH, in)	47x29x4	64x34x6	66x60x6	88x86x6	138x102x6	--
Empty Tray Weight, Each (lb)	20	40	65	150	350	550
Assembly Weight (lb) [4]	360	560	1000	2040	4110	6820
Assembly Operating Weight (lb) [4]	610	940	2230	5550	11,820	21,850
Sump Holding Capacity (gal)	16	30	60	225	500	1000
Influent Connection (NPS) [5]	1.5" FPT	2"	3"	4"	6"	8"
Effluent Connection (NPS) [5]	2"	3"	3"	6"	8"	10"
Off-Gas Discharge OD	4 3/8"	6 3/8"	8 1/2"	12 19/32"	18"	24"

Design Features

- 304 stainless steel welded construction
- Gasoline-resistant neoprene gaskets
- Anti-bypass valve (no priming required)
- Polypropylene demister (99.5% removal efficiency 10 microns and larger)
- Direct coupled blowers
- Clean-out ports (STAT 180-720)

Options

- ☐ Pump-down capability with discharge pump
- ☐ Pressure gauges and switches
- ☐ Water/air flow and temperature monitoring
- ☐ Explosion-proof controls and motors
- ☐ Off-gas carbon filtration
- ☐ Sample taps
- ☐ Control panel packages
- ☐ 316 SS construction
- ☐ Skid Mounted

Service Centers

FLORIDA
4710 Dignan Street
Jacksonville, FL 32254
800.241.7833
904.387.4465
904.387.5058 Fax

MINNESOTA
2731 Nevada Ave. No.
New Hope, MN 55427
800.526.4999
763.544.2154
763.544.2151 Fax

TEXAS
4889 Hunter Rd. Bldg 1-C
San Marcos, TX 78666
800.893.5937
512.392.0085
512.392.0066 Fax

VIRGINIA
4328 West Main Street
Salem, VA 24153
800.204.0324
540.380.5913
540.380.5920 Fax

1. Specifications subject to change without notice
2. Blower HP depends on flow requirements. Single phase motors available up to 5 HP.
3. 6-tray unit without optional skid.
4. Includes approximate blower and ducting weight.
5. 150# flange pattern, unless noted. Effluent size is for gravity drain sumps.

Dwg # 217355

Transfer Pumps P-1 and P-2

VFD

Calculated by:	G. Chen	Date:	8/31/2009
Reviewed by:	J. Ma	Date:	9/4/2009

Purpose: Calculate require head loss and select pump to transfer groundwater from equalization tank to bag filters and air stripper
Design flow rate: 200 gpm; maximum flow rate: 250 gpm.

Calculation of head loss :

Head loss (system) = hz + h_f + h_p

where: h_z = Elevation head (ft)
h_f = Head loss due to pipe/fittings (ft)
h_p = Pressure head (ft)

1. Calculate elevation head h_z :

Low water level in equalization tank =	2	ft above ground
High water level in equalization tank =	8.5	ft above ground
Elevation of bag filter Inlet Pipe =	8	ft above ground
Maximum elevation head =	6	ft
Minimum elevation head =	-0.5	ft

2. Calculate friction loss
Assume 6 inch PVC pipe
Assume 6 inch PVC pipe length is 100 ft

Fittings	Quantity	eq. length ft	total eq. length ft
Check valve	1	227.4	227.4
90° standard elbows	20	15.2	304
Standard Tee	7	32.2	225.4
Total Equivalent Length of fittings			756.8

Total length of pipe 856.8 ft

Calculate friction loss using Hazen-William's equation

$$Hf = 3.022 * v^{1.85} * L / (C^{1.85} * D^{1.17})$$

For PVC pipe C= 130

Hf	Q	v	D	L
ft	gpm	ft/sec	ft	ft
3.26	200	2.3	0.50	856.8
4.93	250	2.8	0.50	856.8

3. Calculate pressure head

a. Pressure head required by bagfilters max = 15 psi
min = 2 psi

b. Pressure head required by air stripper 10 psi

Maximum pressure =	25 psi	57.5 ft
minmum pressure =	12 psi	27.6 ft

Maximum static head	63.50
Minimum static head	27.60

Flow rate (gpm)	200	250
Maximum total dynamic head (ft)	66.76	68.43
Minimum total dynamic head (ft)	30.86	32.53

Select Goulds Pump
Model 3756 M&L 11AIFRMA5
230 Volts, 3 phase, 8 hp
Suction connection 3"; discharge connection 21/2".

Calculated by:	G. Chen	Date:	8/31/2009
Reviewed by:	J. Ma	Date:	9/4/2009

Purpose: Select the pump for transfering water from air stripper to stormwater manhole or to the backwash storage tank (T-7).

Design flow rate: 200 gpm; maximum flow rate: 250 gpm

Scenario 1 Assumptions:

1. Treated groundwater is discharged to a stormwater manhole
2. Discharge pipe is 4" HDPE and buried at 4 feet bgs.

Calculation of head loss :

Head loss (system) = hz + h_f + h_p

where: h_z = Elevation head (ft)

h_f = Head loss due to pipe/fittings (ft)

h_p = Pressure head (ft)

1. Calculate elevation head h_z :

Elevation at the air stripper sump	88	ft
Invert at the stormwater manhole connection	79	ft
Elevation head =	-9	ft
for pump selection, elevation head =	0	ft

2. Calculate head loss due to pipe/fittings: h_f

Assume 4 inch PVC pipe

$h_f = h_{f\,(pipe)} + h_{f\,(fittings)}$

Fittings	Quantity	eq. length	total eq. length	
Check valve	1	151.1	151.1	
Ball valve	4	1	4	
90° street elbows	10	16.8	168	
Standard Tee	4	22.1	88.4	
Total Equivalent Length of fittings			411.5	ft
Length of the pipe from treatment building to manhole			650	ft
Total Length			1061.5	

Calculate friction loss using Hazen-William's equation

$Hf = 3.022 * v^{1.85} * L / (C^{1.85} * D^{1.17})$

For PVC pipe C= 130

Hf	Q	v	D	L
ft	gpm	ft/sec	ft	ft
29.11	200	5.1	0.33	1061.5
43.99	250	6.4	0.33	1061.5

Calculated by:	G. Chen	Date:	8/31/2009
Reviewed by:	J. Ma	Date:	9/4/2009

Scenario 2 Assumptions:

1. Treated groundwater is discharged to the backwash storage tank T-7
2. Discharge pipe is 4" HDPE and buried at 4 feet bgs.

Calculation of head loss :

Head loss (system) = hz + h_f + h_p

where: h_z = Elevation head (ft)

h_f = Head loss due to pipe/fittings (ft)

h_p = Pressure head (ft)

1. Calculate elevation head h_z :

Elevation at the air stripper sump	88 ft
Elevation of the top of backwash tank pipe	97 ft
Elevation head =	9 ft
for pump selection, elevation head =	9 ft

2. Calculate head loss due to pipe/fittings: h_f

Assume 4 inch PVC pipe

$h_f = h_{f\,(pipe)} + h_{f\,(fittings)}$

Fittings	Quantity	eq. length	total eq. length	
Check valve	1	151.1	151.1	
Ball valve	4	1	4	
90° street elbows	10	16.8	168	
Standard Tee	4	22.1	88.4	
motorized Globe valve	1	151	151	
Total Equivalent Length of fittings			562.5	ft
Length of the pipe from air stripper sump to greensand			100	ft
Total Length			662.5	

Calculate friction loss using Hazen-William's equation

$$Hf = 3.022 * v^{1.85} * L / (C^{1.85} * D^{1.17})$$

For PVC pipe C= 130

Hf	Q	v	D	L
ft	gpm	ft/sec	ft	ft
18.17	200	5.1	0.33	662.5
27.46	250	6.4	0.33	662.5

Total head (ft)	Flow rate (gpm)
27.17	200
36.46	250

Note, the motorized globe valve may not be fully open, so the pump can be under proper operation conditions.

Calculated by:	G. Chen	Date:	8/31/2009
Reviewed by:	J. Ma	Date:	9/4/2009

Summary

Flow, gpm	200-250
Head, ft	27 - 44

Select Goulds Pump
Model 3756 M&L 11AIFRMA5
230 Volts, 3 phase, 8 hp
Suction connection 3"; discharge connection 21/2".

CARRYING CAPACITY & FRICTION LOSS

TABLE 30

CARRYING CAPACITY AND FRICTION LOSS FOR SCHEDULE 40 THERMOPLASTIC PIPE

(Independent variables: Gallons per minute and nominal pipe size O.D.
Dependent variables: Velocity, friction head and pressure drop per 100 feet of pipe, interior smooth .)

GALLONS PER MINUTE	VELOCITY FEET PER SECOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SECOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SECOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SECOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SECOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SECOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SECOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SECOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH
	1/2 IN.			3/4 IN.			1 IN.			1-1/4 IN.			1-1/2 IN.			2 IN.			2-1/2 IN.			3 IN.		
1	1.13	2.08	0.90	0.63	0.51	0.22																		
2	2.26	4.16	1.80	1.26	1.02	0.44	0.77	0.65	0.24	0.44	0.14	0.06	0.33	0.07	0.03									
5	5.64	23.44	10.15	3.16	5.73	2.48	1.93	1.72	0.75	1.11	0.44	0.19	0.81	0.22	0.09	0.49	0.066	0.029	0.30	0.038	0.016	0.22	0.015	0.007
7	7.90	43.06	13.64	4.43	10.52	4.56	2.72	3.17	1.37	1.55	0.81	0.35	1.13	0.38	0.17	0.69	0.11	0.048	0.49	0.051	0.023	0.31	0.021	0.009
10	11.28	82.02	35.51	6.32	20.04	8.68	3.86	6.02	2.61	2.21	1.55	0.67	1.62	0.72	0.31	0.98	0.21	0.091	0.68	0.09	0.039	0.44	0.03	0.013
15		4 IN.		9.48	42.46	18.39	5.79	12.77	5.53	3.31	3.28	1.42	2.42	1.53	0.66	1.46	0.46	0.19	1.03	0.19	0.082	0.66	0.07	0.030
20	0.51	0.03	0.013	12.65	72.34	31.32	7.72	21.75	9.42	4.42	5.59	2.42	3.23	2.61	1.13	1.95	0.76	0.33	1.37	0.32	0.14	0.88	0.11	0.048
25	0.64	0.04	0.017		5 IN.		9.65	32.88	14.22	5.52	8.45	3.66	4.04	3.95	1.71	2.44	1.15	0.50	1.71	0.49	0.21	1.10	0.17	0.074
30	0.77	0.06	0.026	0.49	0.02	0.009	11.58	46.08	19.95	6.63	11.85	5.13	4.85	5.53	2.39	2.93	1.62	0.70	2.05	0.68	0.29	1.33	0.23	0.10
35	0.89	0.08	0.035	0.57	0.03	0.013				7.73	15.75	6.82	5.66	7.36	3.19	3.41	2.15	0.93	2.39	0.91	0.39	1.55	0.31	0.13
40	1.02	0.11	0.048	0.65	0.03	0.013				8.84	20.18	8.74	6.47	9.43	4.08	3.90	2.75	1.19	2.73	1.16	0.50	1.77	0.40	0.17
45	1.15	0.13	0.056	0.73	0.04	0.017		6 IN.		9.94	25.10	10.87	7.27	11.73	5.08	4.39	3.43	1.49	3.08	1.44	0.62	1.99	0.50	0.22
50	1.28	0.16	0.069	0.81	0.05	0.022	0.56	0.02	0.009	11.05	30.51	13.21	8.08	14.25	6.17	4.88	4.16	1.80	3.42	1.75	0.76	2.21	0.60	0.26
60	1.53	0.22	0.095	0.97	0.07	0.030	0.67	0.03	0.013				9.70	19.88	8.65	5.85	5.84	2.53	4.10	2.46	1.07	2.65	0.85	0.37
70	1.79	0.30	0.13	1.14	0.10	0.043	0.79	0.04	0.017							6.83	7.76	3.36	4.79	3.27	1.42	3.09	1.13	0.49
75	1.92	0.34	0.15	1.22	0.11	0.048	0.84	0.05	0.022							7.32	8.82	3.82	5.13	3.71	1.61	3.31	1.28	0.55
80	2.05	0.38	0.16	1.30	0.13	0.056	0.90	0.05	0.022		8 IN.					7.80	9.94	4.30	5.47	4.19	1.81	3.53	1.44	0.62
90	2.30	0.47	0.20	1.46	0.16	0.069	1.01	0.06	0.026							8.78	12.37	5.36	6.15	5.21	2.26	3.98	1.80	0.78
100	2.56	0.58	0.25	1.62	0.19	0.082	1.12	0.08	0.036	0.65	0.03	0.012				9.75	15.03	6.51	6.84	6.33	2.74	4.42	2.18	0.94
125	3.20	0.88	0.38	2.03	0.29	0.125	1.41	0.12	0.052	0.81	0.035	0.015							8.55	9.58	4.15	5.52	3.31	1.43
150	3.84	1.22	0.53	2.44	0.40	0.17	1.69	0.16	0.069	0.97	0.04	0.017		10 IN.					10.26	13.41	5.81	6.63	4.63	2.00
175	4.48	1.63	0.71	2.84	0.54	0.235	1.97	0.22	0.096	1.14	0.056	0.024										7.73	6.16	2.67
200	5.11	2.08	0.90	3.25	0.69	0.30	2.25	0.28	0.12	1.30	0.07	0.030	0.82	0.027	0.012							8.83	7.88	3.41
250	6.40	3.15	1.36	4.06	1.05	0.45	2.81	0.43	0.19	1.63	0.11	0.048	1.03	0.035	0.015		12 IN.					11.04	11.93	5.17
300	7.67	4.41	1.91	4.87	1.46	0.63	3.37	0.60	0.26	1.94	0.16	0.069	1.23	0.05	0.022									
350	8.95	5.87	2.55	5.69	1.95	0.85	3.94	0.79	0.34	2.27	0.21	0.091	1.44	0.065	0.028	1.01	0.027	0.012						
400	10.23	7.52	3.26	6.50	2.49	1.08	4.49	1.01	0.44	2.59	0.27	0.12	1.64	0.09	0.039	1.16	0.04	0.017						
450				7.31	3.09	1.34	5.06	1.28	0.55	2.92	0.33	0.14	1.85	0.11	0.048	1.30	0.05	0.022						
500				8.12	3.76	1.63	5.62	1.53	0.66	3.24	0.40	0.17	2.05	0.13	0.056	1.45	0.06	0.026						
750							8.43	3.25	1.41	4.86	0.85	0.37	3.08	0.28	0.12	2.17	0.12	0.052						
1000							11.24	5.54	2.40	6.48	1.45	0.63	4.11	0.48	0.21	2.89	0.20	0.087						
1250										8.11	2.20	0.95	5.14	0.73	0.32	3.62	0.31	0.13						
1500										9.72	3.07	1.33	6.16	1.01	0.44	4.34	0.43	0.19						
2000													8.21	1.72	0.74	5.78	0.73	0.32						
2500													10.27	2.61	1.13	7.23	1.11	0.49						
3000																8.68	1.55	0.67						
3500																10.12	2.07	0.90						
4000																11.07	2.66	1.15						

EQUIVALENT LENGTH OF THERMOPLASTIC PIPE IN FEET

				¼"	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	6"	8"	10"	12"
GLOBE VALVES	Conventional	With no obstruction in flat, bevel, or plug type seat	Fully Open	10.3	17.6	23.3	29.7	39.1	45.6	58.6	69.95	86.9	114.1	171.8	226.1	283.9	338.2
		With wing or pin guided disc	Fully Open	13.7	23.3	30.9	39.3	51.8	60.4	77.5	92.8	115.1	151.0	227.4	299.3	375.8	447.7
	Y-Pattern	(No obstruction in flat, bevel or plug type seat) —With stem 60 degrees from run of pipe line	Fully Open	5.3	9.1	12.0	15.3	20.1	23.5	30.1	36.0	44.7	58.7	88.4	116.4	146.1	174.1
		—With stem 45 degrees from run of pipe line	Fully Open	4.4	7.5	10.0	12.7	16.7	19.5	25.0	29.8	37.1	48.6	73.3	96.4	121.1	144.3
ANGLE VALVES	Conventional	With no obstruction in flat, bevel, plug type seat	Fully Open	4.4	7.5	10.0	12.7	16.7	19.5	25.0	29.8	37.1	48.6	73.3	96.4	121.1	144.3
		With wing or pin guided disc	Fully Open	6.1	10.4	13.7	17.5	23.0	26.8	34.5	41.2	51.1	67.1	101.1	133.0	167.0	199.0
GATE VALVES	Conventional Wedge Disc, Dbl Disc, or Plug Disc		Fully Open	0.4	0.7	0.9	1.1	1.5	1.7	2.2	2.7	3.3	4.4	6.6	8.6	10.9	12.9
			Three-Quarters Open	1.1	1.8	2.4	3.1	4.0	4.7	6.0	7.2	8.9	11.7	17.7	23.3	29.2	34.8
			One-Half Open	4.8	8.3	11.0	14.0	18.4	21.5	27.6	32.9	40.9	53.7	80.9	106.4	133.6	159.2
			One-Quarter Open	27.3	45.7	61.8	78.7	103.5	120.8	155.0	185.2	230.1	302.0	454.9	598.6	751.5	895.4
BALL VALVES	Full Port Design		Fully Open	Same as an equivalent of Sch. 80 Pipe													
FITTINGS	90° Standard Elbow			0.9	1.6	2.1	2.6	3.5	4.0	5.5	6.2	7.7	10.1	15.2	20.0	25.1	29.8
	45° Standard Elbow			0.5	0.8	1.1	1.4	1.8	2 1	2.8	3.3	4.1	5.4	8.1	10.6	13.4	15.9
	90° Long Radius Elbow			0.6	1.0	1.4	1.7	2.3	2.7	4.3	5.1	6.3	8.3	12.5	16.5	20.7	24.7
	90° Street Elbow			1.5	2.6	3.4	4.4	5.8	6.7	8.6	10.3	12.8	16.8	25.3	33.3	41.8	49.78
	45° Street Elbow			0.8	1.3	1.8	2.3	3.0	3.5	4.5	5.4	6.6	8.7	13.1	17.3	21.7	25.9
	Square Corner Elbow			1.7	3.0	3.9	5.0	6.5	7.6	9.8	11.7	14.6	19.1	28.8	37.9	47.6	56.7
	Standard Tee	With Flow through run		0.6	1.0	1.4	1.7	2.3	2.7	4.3	5.1	6.3	8.3	12.5	16.5	20.7	24.7
		With Flow through branch		1.8	4.0	5.1	6.0	6.9	8.1	12	14.3	16.3	22.1	32.2	39.9	50.1	59.7

CARRYING CAPACITY & FRICTION LOSS

TABLE 37

GOULDS PUMPS

Submittal Data

3756 M&L All Iron
End Suction
MODEL : 11AIFRMA5

Hydraulic Data					Motor Data	3656/3756 M L Group Model	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure		
353 US g.p.m.	200 US g.p.m.	116 ft	89 ft	8 ft		11AIFRMA5	1

Submittal Prepared for: ______ Job: ______
Engineer: ______ Contractor: ______
Submittal Prepared by: ______ Company: ______
Submittal Date: 2008-09-05 Approved by: ______ Date: ______

Engineering Data

Pump Code: 11AIFRMA5
Pump Size: 2 1/2 x 3 - 10
Pump Max Horsepower: 11.196 hp
Pump Horsepower at Rating Point: 7.96 hp
Pump Shut Off Head: 116 ft
Motor Speed:
Max. Temperature: 212 °F
Liquid: Water
Motor Code:
System Input Power:
Motor Rated Horsepower:
Max. Frequency:
Electrical Enclosures:
Motor Standard:
Suction Flange Standard: ANSI
Suction Flange Rating: Class 125
Suction Size: 3"
Discharge Flange Standard: ANSI
Discharge Flange Rating: Class 125
Discharge: 2 1/2"
Approximate Net Weight: On demand lb
Impeller Size: $10^1/_{16}$"
Impeller Construction: Closed
Impeller Type: Radial impeller
Impeller Material:
Cast Iron ASTM A48 CL20
Sense of Rotation: Clockwise from the drive end
Shaft Seal: Sil-Carbide/Sil-Carbide/Viton

Standard Equipment / Capability:

The 3656 and 3756 M & L-Group pumps from Goulds have been designed with technical benefits to meet the needs of users in a variety of water supply, recirculation, and cooling applications.
• The model 3656 offers close coupled design for space saving and simplified maintenance.
• The model 3756 offers a bearing frame mounted design for flexibility of installation and drive arrangements.
• SAE drive sizes 1 through 5 available on all pumps.
• Back pull-out to reduce maintenance down time.
• Standard Type 21 mechanical seal for both reliability and availability. Carbon/ceramic/ BUNA standard, with other faces and elastomers available.
• Available in packed stuffing box design with TeflonTM impregnated packing, split Teflon lantern ring, tapped flush connection and 2 piece investment cast interlocking gland, all standard.
• Available in all iron or bronze fitted construction for application versatility.
• Replaceable wearing components include stainless steel shaft sleeve and casing and hub wear rings to maintain peak efficiency.
• Enclosed impeller design, dynamic balancing and renewable wear rings reduce losses affecting performance and pump life.
• 125 Class ANSI flange suction/ discharge connections and casing rotation for piping connection versatility.
• NPT threaded connections are supplied on 1 1/2 x 2 – 10 and 2 1/2 x 3 – 8 models.
• Optional rigid carbon steel bedplate, sheet metal coupling guard and T. B. Woods spacer coupling for 3756 models.
• Standard NEMA motor frame, JM shaft extension (mechanical seal) JP shaft extension (packed box), C face mounting, single phase or three phase, 3500 or 1750 RPM for 60 Hz, 2900 or 1450 RPM for 50 Hz. Open drip-proof and totally enclosed fan cooled.
• Optional explosion proof and high efficiency motors are available.

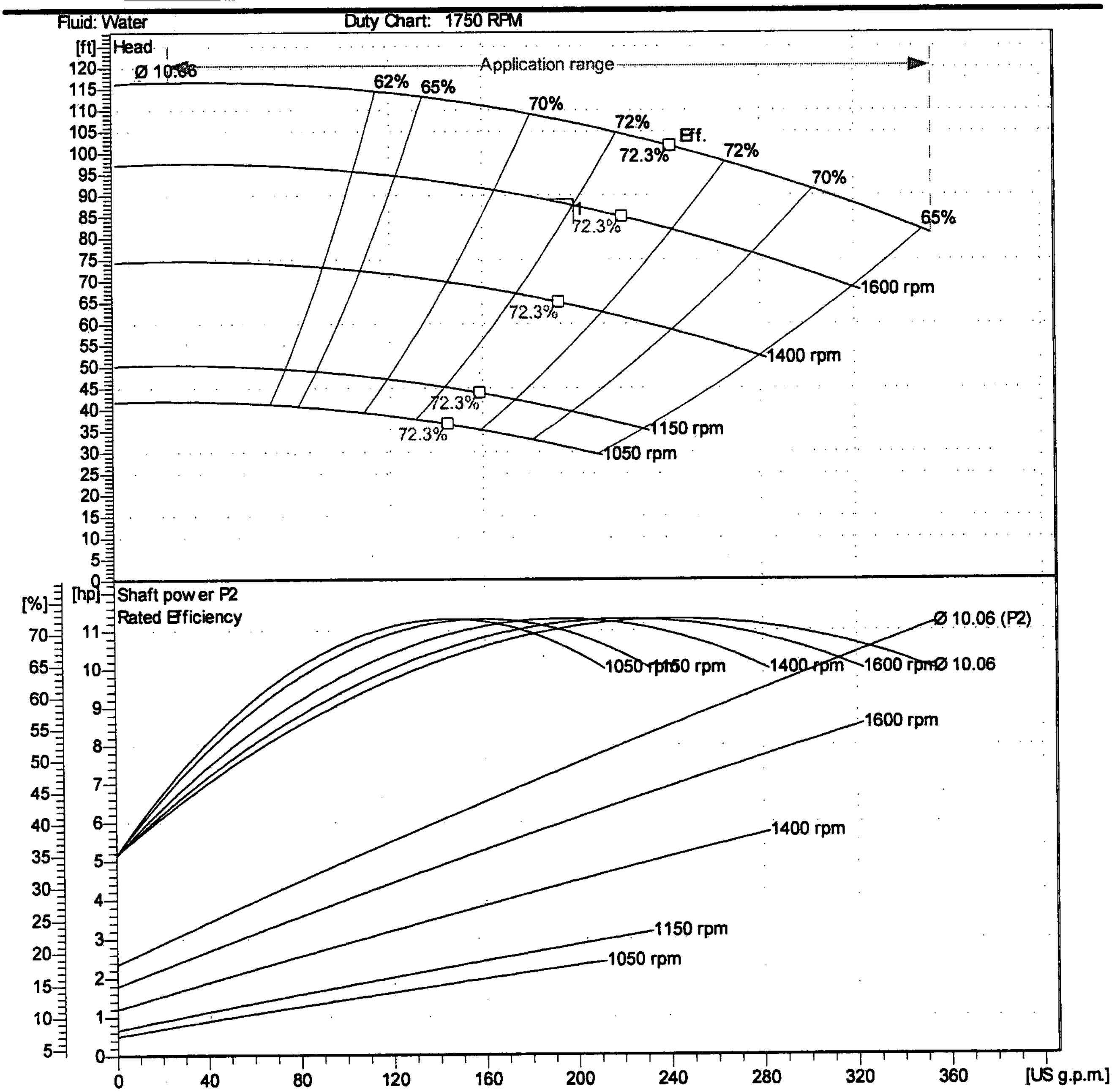
GOULDS PUMPS
Performance Data

3756 M&L All Iron
End Suction
MODEL : 11AIFRMA5

Hydraulic Data					Motor Data	3656/3756 M L Group Model	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure		
353 US g.p.m.	200 US g.p.m.	116 ft	89 ft	8 ft		11AIFRMA5	1

Submittal Prepared for: ________
Engineer: ________
Submittal Prepared by: ________
Submittal Date: 2008-09-05

Job: ________
Contractor: ________
Company: ________
Approved by: ________ Date: ________



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2008-09-05

GOULDS PUMPS

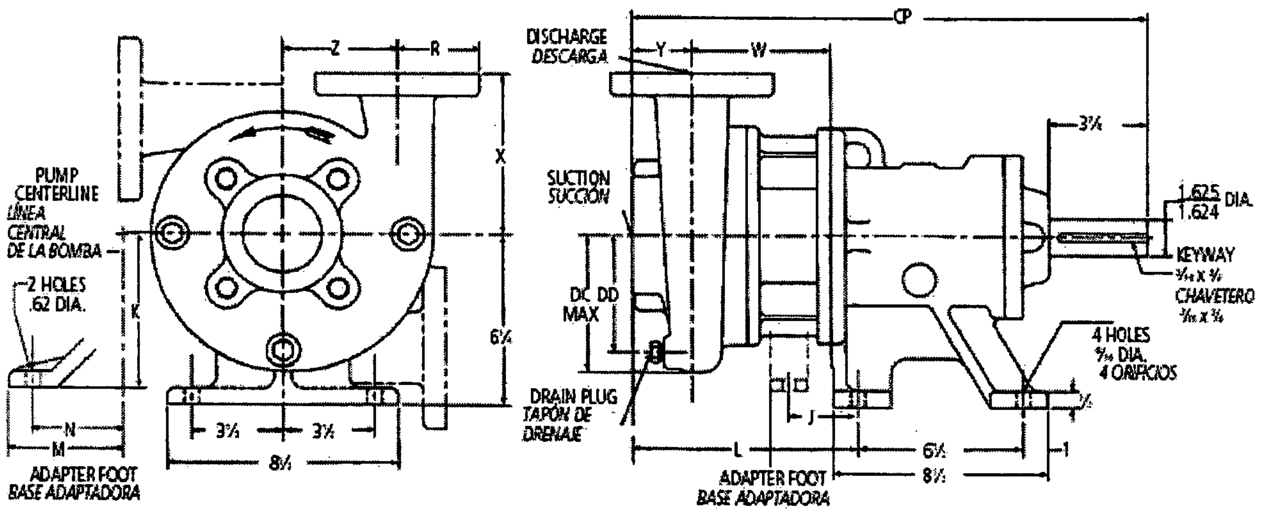
Unit Dimensions

3756 M&L All Iron
End Suction
MODEL : 11AIFRMA5

Hydraulic Data					Motor Data	3656/3756 M L Group Model	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure		
353 US g.p.m.	200 US g.p.m.	116 ft	89 ft	8 ft		11AIFRMA5	1

Submittal Prepared for: ______________________
Engineer: ______________________
Submittal Prepared by: ______________________
Submittal Date: 2008-09-05

Job: ______________________
Contractor: ______________________
Company: ______________________
Approved by: ______________________ Date: __________



Dimension	Value	Dimension	Value
CP max	21⅝		
DC max	7⅛		
DD	6		
Discharge	2.5" ANSI		
Flange	ANSI class 150		
R	3½		
Suction	3" ANSI		
W	5		
X	7½		
Y	2¾		
Z	5½		

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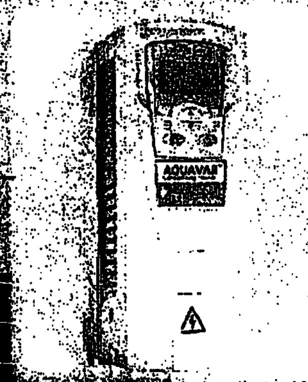
Goulds Pumps

AQUAVAR® CPC

Variable Speed Centrifugal Pump Controller



GOULDS PUMPS

VFD

Engineered for life

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GOULDS PUMPS
Commercial Water

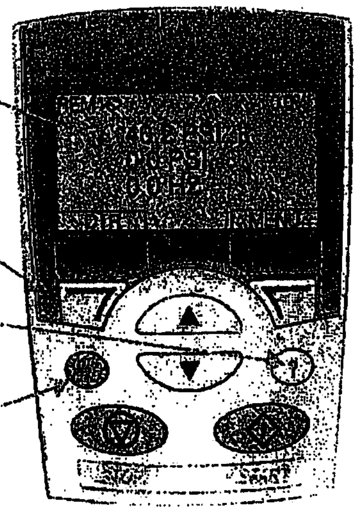
Introduction

The **Aquavar® CPC** (Centrifugal Pump Controller) from Goulds Pumps incorporates the latest state-of-the-art Aquavar technology, with over 10 years of experience providing variable speed pump controllers. The Aquavar CPC is a variable frequency drive and pump specific PLC in one compact unit, that will vary the speed of the motor to maintain a consistent pressure, flow, temperature or level. Here are just a few of the features and benefits of this innovative product:

- Compatible with previous versions of Aquavar, using version 120 software.
- Start-up "wizards" expedite the programming process, for specific applications.
- Removable control panel/display.
- Fully backlit display with large text makes the control pad easy to read.
- Dedicated help key activates parameter descriptions to enable an easy reference to the programming guide.
- Transducer assembly (0-300 psi) and 30-foot shielded cable included for constant pressure.
- Helps protect the pump from cavitation, dead head and blocked suction.
- Helps protect the motor from short circuit, phase loss, overload, undervoltage, overvoltage.
- Help key activates parameter descriptions to aid in the programming process.
- Integrated line choke reduces harmonics and provides 3-5% impedence line reactor.
- EMC/RFI filters reduces drive noise emissions and interference.
- Preventative maintenance reminders.
- Fault logger records the last 3 faults and drive characteristics at the time of fault.
- Detachable conduit box allows more space for incoming power and motor wiring.
- Fieldbus compatible, standard Modbus® Protocol (SCADA).
- Capable of controlling up to 3 fixed speed pumps, with one drive.
- Multipump control for up to 4 pumps, without additional PLC's or control panels.
- Auto lead/lag and switching control built in.
- Two point pressure controls.
- Priming delay feature.
- Energy savings versus standard fixed speed system. Onboard energy calculator.

Layout

- Port for quickly inserting / removing control panel (keypad).
- Easy to access terminal block for control wiring of transducer and other peripheral devices.
- Relay outputs to provide control wiring for up to three fixed speed pumps (Note: slave pumps require their own starters).
- Multipump RS 485 connection. Connect up to 4 pumps without additional PLCs!
- Port for optional fieldbus communication cards (Modbus® included as standard).
- Conduit box is quickly removed with two screws providing easy access to main power and wiring terminals.



- Backlit display with large, easy-to-read characters.
- Cell phone style keypad allows the user to quickly change parameters and save modifications.
- Help key enables onboard parameter explanation to expedite the programming process.
- Local/Remote allows operator to run motor at full speed manual control or via transducer.

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GOULDS PUMPS
Commercial Water

Product Overview

Ratings and Enclosures

- NEMA 1 (indoor use) standard; other enclosures are available upon request.
- 1 – 150 HP (frame R1 – R6) wall mounted.
  200 – 550 HP (frame R7 and R8) floor mounted.
- Ambient temperature 5° F – 104° F. Higher temperatures can be achieved using optional enclosure upgrades and derating factor for up to 122° F.
- At altitudes from 0 to 3300 feet rated current is available, for every 328 feet above 3300 feet the current must be derated 1%. Maximum 6600 feet (consult factory above 6600 feet).
- Relative humidity lower than 95% without condensation.
- UL 508C compliant. UL approved.

Electrical Characteristics

Input Power
- 3 phase 380 V to 480 V +10%/-15%
- 1 phase 208 V to 240 V +10%/-15%
- 3 phase 208 V to 240 V +10%/-15%
- 3 phase 575 V +10%/-15%
- Frequency 48 to 63 Hz
- .98 power factor

Output Power
- 3 phase from 0 to V_{supply} (All motors must be 3 phase.)
- 0 to 60 Hz frequency

Model Number Interpretation

TYPE CODE

CPC 4 370 1

AQUAVAR® CPC (Series) — CPC

Voltage — 4
- 2 – 230 Volt
- 4 – 460 Volt
- 5 – 575 Volt

Amps — 370
370 Amps *See Technical Section

NEMA Enclosure Rating — 1
1 – NEMA 1 (indoor)
2 – NEMA 12 (indoor - dustproof)
3 – NEMA 3 (outdoor rainproof)
4 – NEMA 4 (washdown/outdoor)

Options
- Field Bus Card (requires part numbers)
- Fused Disconnect (requires part numbers)
- Load Reactor

** Consult factory for other options, if available. Not all combinations may be available.*

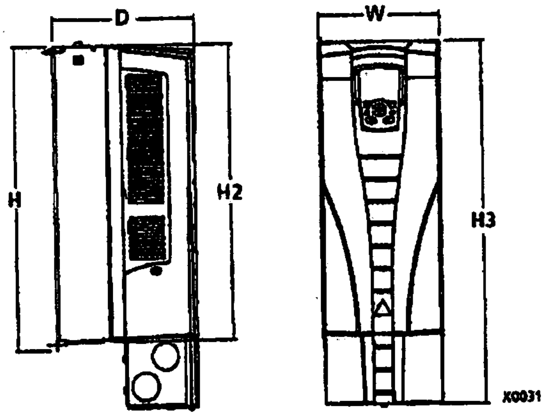
Weights and Dimensions

Frame Sizes R1 through R6 *(see product chart for horsepower)*

The dimensions and mass for the AQUAVAR depend on the frame size and enclosure type. If unsure of frame size, first, find the "Type" code on the drive labels. Then look up that type code in the "Technical Data", to determine the frame size. A complete set of dimensional drawings for AQUAVAR drives is located in the Technical Reference section of the IOM (Installation, Operation Manual).

Units with UL Type 1 Enclosures

Outside Dimensions



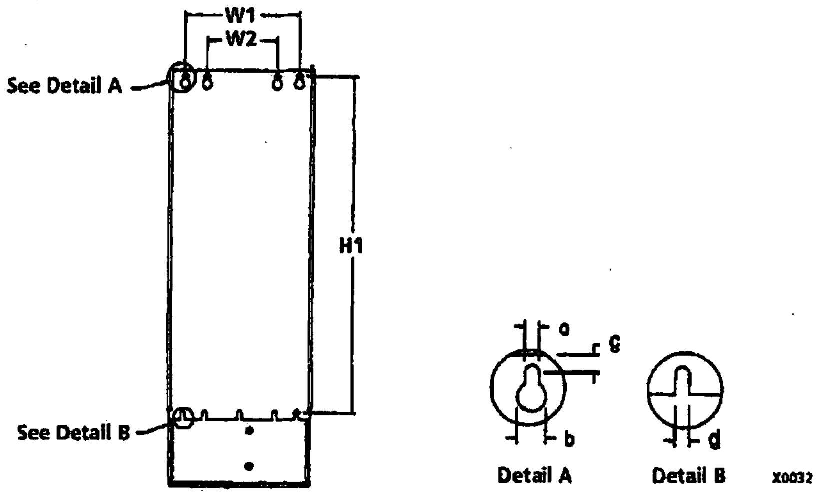
UL Type 1 – Dimensions for each Frame Size												
Ref.	R1		R2		R3		R4		R5		R6	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
W	125	4.9	125	4.9	203	8.0	203	8.0	265	10.4	300	11.8
H	330	13.0	430	16.9	490	19.3	596	23.4	602	23.7	700	27.6
H2	315	12.4	415	16.3	478	18.8	583	23.0	578	22.8	698	27.5
H3	369	14.5	469	18.5	583	23.0	689	27.1	739	29.1	880	34.6
D	212	8.3	222	8.7	231	9.1	262	10.3	286	11.3	400	15.8

NOTE: *Enclosures are standard NEMA 1, indoor use only.*
For outdoor, NEMA 3R enclosures, consult factory.

Weights and Dimensions

Frame Sizes R1 through R6 *(see product chart for horsepower)*

Mounting Dimensions



UL Type 1 – Dimensions for each Frame Size												
Ref.	R1		R2		R3		R4		R5		R6	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
W1*	98.0	3.9	98.0	3.9	160	6.3	160	6.3	238	9.4	263	10.4
W2*	—	—	—	—	98.0	3.9	98.0	3.9	—	—	—	—
H1*	318	12.5	418	16.4	473	18.6	578	22.8	588	23.2	675	26.6
a	5.5	0.2	5.5	0.2	6.5	0.25	6.5	0.25	6.5	0.25	9.0	0.35
b	10.0	0.4	10.0	0.4	13.0	0.5	13.0	0.5	14.0	0.55	14.0	0.55
c	5.5	0.2	5.5	0.2	8.0	0.3	8.0	0.3	8.5	0.3	8.5	0.3
d	5.5	0.2	5.5	0.2	6.5	0.25	6.5	0.25	6.5	0.25	9.0	0.35

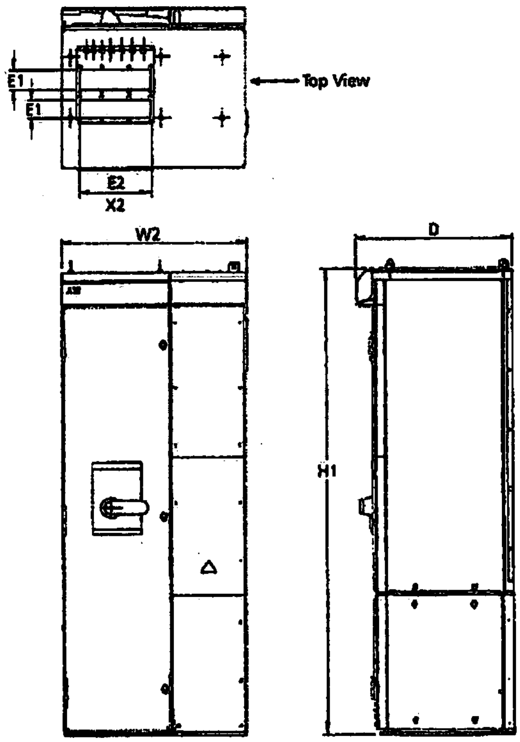
* Center to center dimension.

Weight

UL Type 1 – Weight for each Frame Size											
R1		R2		R3		R4		R5		R6	
kg	lb.	kg	lb.	kg	lb.	kg	lb.	kg	lb.	kg	lb.
6.1	13.4	8.9	19.5	14.7	32.4	22.8	50.2	37	82	78	176

Weights and Dimensions

Frame Sizes R7 and R8 *(see product chart for horsepower)*



NEMA 1 Enclosure												
Frame	H1		W2		Depth		Weight		E1		E2	
	mm	in	mm	in	mm	in	kg	lb	mm	in	mm	in
R7	1503	59.17	609	23.98	495	19.49	195	430	92	3.62	250	9.84
R8	2130	83.86	800	31.5	585	23.03	375	827	92	3.62	250	9.84

Drawing is not for engineering purposes.

NOTE: *Fusible disconnect included for 200 through 550 HP.*

ITT

Commercial Water

Product Chart

INPUT VOLTAGE	INPUT PHASE	NEMA 1 BASE MODEL	Cont. Output Amps Normal Duty ①	NORMAL DUTY HORSEPOWER ②	Frame Size
[illegible]	[illegible]	[illegible]	[illegible]	2	R1
		[illegible]	[illegible]	3	R2
		[illegible]	[illegible]	5	R2
		[illegible]	[illegible]	7.5	R3
		[illegible]	[illegible]	10	R3
		[illegible]	[illegible]	15	R4
		[illegible]	[illegible]	20	R4
		[illegible]	[illegible]	25	R5
		[illegible]	[illegible]	30	R5
		[illegible]	[illegible]	40	R6
		[illegible]	[illegible]	50	R6
[illegible]	[illegible]	[illegible]	[illegible]	3	R1
		[illegible]	[illegible]	5	R1
		[illegible]	[illegible]	7.5	R2
		[illegible]	[illegible]	10	R2
		[illegible]	[illegible]	15	R3
		[illegible]	[illegible]	20	R3
		[illegible]	[illegible]	25	R4
		[illegible]	[illegible]	30	R4
		[illegible]	[illegible]	40	R4
		[illegible]	[illegible]	50	R5
		[illegible]	[illegible]	60	R5
		[illegible]	[illegible]	75	R5
		[illegible]	[illegible]	100	R6
[illegible]	[illegible]	[illegible]	[illegible]	3	R1
		[illegible]	[illegible]	5	R1
		[illegible]	[illegible]	7.5	R1
		[illegible]	[illegible]	10	R2
		[illegible]	[illegible]	15	R2
		[illegible]	[illegible]	20	R3
		[illegible]	[illegible]	25	R3
		[illegible]	[illegible]	30	R4
		[illegible]	[illegible]	40	R4
		[illegible]	[illegible]	50	R4
		[illegible]	[illegible]	60	R5
		[illegible]	[illegible]	75	R5
		[illegible]	[illegible]	100	R6
		[illegible]	[illegible]	125	R6
		[illegible]	[illegible]	150	R6
		[illegible]	[illegible]	200	R7
		[illegible]	[illegible]	250	R7
		[illegible]	[illegible]	300	R8
		[illegible]	[illegible]	350	R8
		[illegible]	[illegible]	400	R8
		[illegible]	[illegible]	450	R8
		[illegible]	[illegible]	500	R8
		[illegible]	[illegible]	550	R8
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	R2
		[illegible]	[illegible]	[illegible]	R2
		[illegible]	[illegible]	5	R2
		[illegible]	[illegible]	7.5	R2
		[illegible]	[illegible]	10	R2
		[illegible]	[illegible]	15	R2
		[illegible]	[illegible]	20	R2
		[illegible]	[illegible]	25	R3
		[illegible]	[illegible]	30	R4
		[illegible]	[illegible]	40	R4
		[illegible]	[illegible]	50	R4
		[illegible]	[illegible]	60	R4
		[illegible]	[illegible]	75	[illegible]
		[illegible]	[illegible]	100	[illegible]
		[illegible]	[illegible]	125	[illegible]
		[illegible]	[illegible]	150	R6

① NOTE: [illegible] ALWAYS [illegible] maximum amp rating before selecting drive.

GOULDS PUMPS

BRAOCEC September 2006

Engineered for life

Transfer Pump P-3

Calculated by:	G. Chen	Date:	9/2/2008
Reviewed by:	J. Ma	Date:	9/11/2008

Purpose: Calculate require head loss and select pump to transfer groundwater from sludge settling tank to equalization tank

Calculation of head loss :

Head loss (system) = hz + h_f + h_p

where: h_z = Elevation head (ft)

h_f = Head loss due to pipe/fittings (ft)

h_p = Pressure head (ft)

1. Calculate elevation head h_z :

Pipe elevation at equalization tank =	12 ft above ground
Low water level in sludge settling tank =	4.5 ft above ground
High water level in sludge settling tank =	9.5 ft above ground
Maximum Elevation head during pumping=	7.5 ft
Minimum Elevation head during pumping=	2.5 ft

2. Calculate friction loss

Assume 2 1/2 inch PVC pipe

Assume 2 1/2 inch PVC pipe length is 93 ft

Fittings	Quantity	eq. length ft	total eq. length ft
Check valve	1	92.6	92.6
90° standard elbows	8	6.2	49.6
Standard Tee	2	14.3	28.6
Total Equivalent Length of fittings			170.8

Total length of pipe 263.8 ft

Calculate friction loss using Hazen-William's equation

2 1/2-inch PVC pipe

$Hf = 3.022 * v^{1.85} * L / (C^{1.85} * D^{1.17})$

For PVC pipe C= 130

Hf	Q	v	D	L	
ft	gpm	ft/sec	ft	ft	
5.49	50	3.3	0.21	263.8	
16.29	90	5.9	0.21	263.8	maximum flow condition

3. Calculate pressure head

Assume no pressure head

total dynamic head varies between 7.99 ft and 23.79 ft

Select Goulds Pump 3756 s All Iron
4AIFRMJ4
3/4 hp
Suction connection 3" and discharge connection 2 1/2".

GOULDS PUMPS

Submittal Data

3756 S All Iron

End Suction

MODEL : 4AIFRMJ4

Hydraulic Data					Motor Data	3656/3756 S Group	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	NPSHR	Voltage / Phase / Enclosure	Model	
112 US g.p.m.	50 US g.p.m.	20 ft	20 ft	3 ft	208-230V 3PH TEFC	4AIFRMJ4	1

Submittal Prepared for: __________ Job: __________

Engineer: __________ Contractor: __________

Submittal Prepared by: __________ Company: __________

Submittal Date: 2008-09-08 Approved by: __________ Date: __________

Engineering Data

Pump Code: 4AIFRMJ4
Pump Size: 2 1/2 x 3 - 7
Pump Max Horsepower: 0.66092 hp
Pump Horsepower at Rating Point: 0.41 hp
Pump Shut Off Head: 20 ft
Motor Speed: 1750 rpm
Max. Temperature: 212 °F
Liquid: Water
Motor Code: H06132
System Input Power: 3~ 208 V
Motor Rated Horsepower: 1.00 hp
Max. Frequency 60
Electrical Enclosures: TEFC
Motor Standard: NEMA
Suction Flange Standard: NPT
Suction Flange Rating: 175 PSI
Suction Size: 3"
Discharge Flange Standard: NPT
Discharge Flange Rating: 175 PSI
Discharge: 2 1/2"
Approximate Net Weight: 81 lb
Impeller Size: 4 1/2"
Impeller Construction: Closed
Impeller Type: Radial impeller
Impeller Material:
Cast Iron ASTM A48 CL20
Sense of Rotation: Clockwise from the drive end
Shaft Seal: Sil-Carbide/Sil-Carbide/Viton

Standard Equipment / Capability:

Features and Benefits
The 3656 and 3756 S-Group pumps from Goulds have been designed with technical benefits to meet the needs of users in a variety of water supply, recirculation, and cooling applications.
The model 3656 offers close coupled design for space saving and simplified maintenance.
The model 3756 offers a bearing frame mounted design for flexibility of installation and drive arrangements. Back pull-out to reduce maintenance down time.
Standard Type 21 mechanical seal for both reliability and availability. Carbon/ceramic/ BUNA standard, with other faces and elastomers available.
3656/3756 available in all iron, bronze fitted or all bronze construction for application versatility.
Replaceable wearing components include stainless steel shaft sleeve and casing and hub wear rings to maintain peak efficiency.
Packed box sealing is also available as an option.
Enclosed impeller design, dynamic balancing and renewable wear rings reduce losses affecting performance and pump life.
Suction and discharge pipe connections are NPT threaded, except 3 x 4 7 which has 125 lb. ANSI flat faced flanges.
Rigid cast iron motor adapter provides support and registered fits maintain positive unit alignment.
Standard NEMA motor frame, JM or JP shaft extension, C-face mounting, single phase or three phase, 3500 or 1750 RPM. Open drip proof and totally enclosed fan cooled.
Optional explosion proof or high efficiency motors available.
Optional rigid carbon steel bedplate, sheet metal coupling guard and T. B. Woods spacer coupling for 3756 models.

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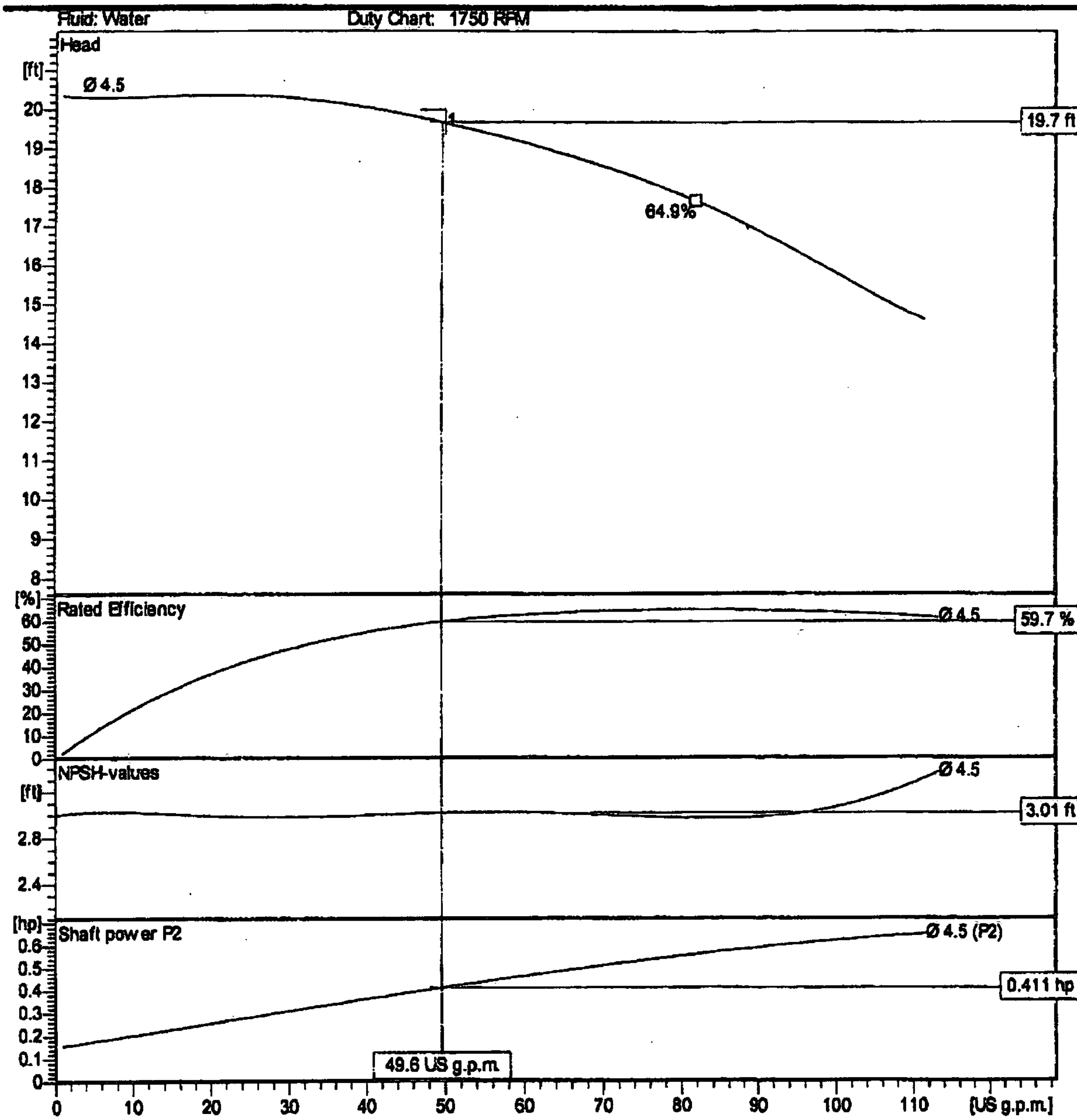
GOULDS PUMPS

Performance Data

3756 S All Iron
End Suction
MODEL : 4AIFRMJ4

Hydraulic Data					Motor Data	3656/3756 S Group	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure	Model	
112 US g.p.m.	50 US g.p.m.	20 ft	20 ft	3 ft	208-230V 3PH TEFC	4AIFRMJ4	1

Submittal Prepared for: ______________________ Job: ______________________
Engineer: ______________________ Contractor: ______________________
Submittal Prepared by: ______________________ Company: ______________________
Submittal Date: 2008-09-08 Approved by: ______________________ Date: ______



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2008-09-08

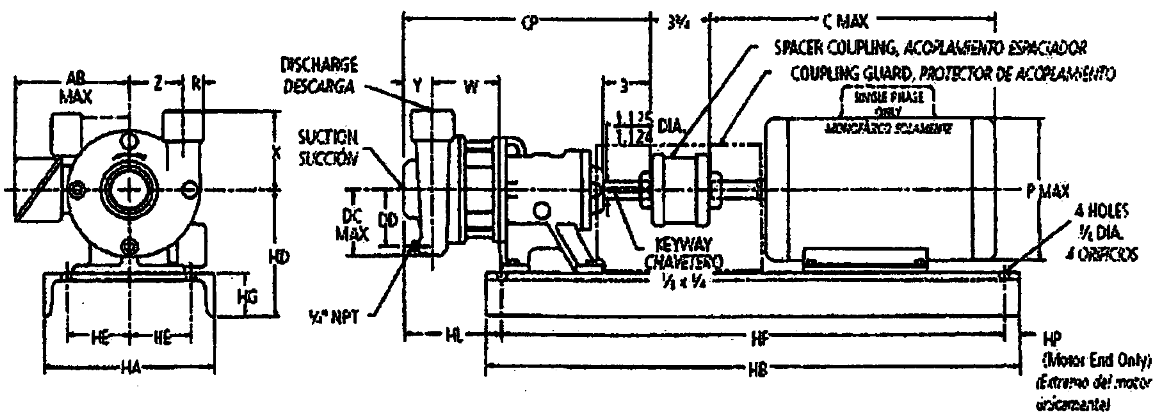
GOULDS PUMPS

Unit Dimensions

3756 S All Iron
End Suction
MODEL : 4AIFRMJ4

Hydraulic Data					Motor Data	3656/3756 S Group	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	NPSH$_R$	Voltage / Phase / Enclosure	Model	
112 US g.p.m.	50 US g.p.m.	20 ft	20 ft	3 ft	208-230V 3PH TEFC	4AIFRMJ4	1

Submittal Prepared for: ______________________ Job: ______________________
Engineer: ______________________ Contractor: ______________________
Submittal Prepared by: ______________________ Company: ______________________
Submittal Date: 2008-09-08 Approved by: ______________________ Date: __________



Dimension	Value	Dimension	Value
AB max	5 1/4	HG	2 3/4
C max	13 3/8	HL	12 11/16
CP max	16 7/8	HP	3/4
DC max	5 1/8	P max	5 1/4
DD	4 1/2	R	1 13/16
Discharge	2.5 NPT	Suction	3 NPT
HA	10	W	4 1/4
HB	28	X	6
HD	8	Y	3
HE	3 3/4	Z	4
HF	24		

Printed from data file
2008-09-08

Transfer Pump P-5

Calculated by:	G. Chen	Date:	8/31/2009
Reviewed by:	J. Ma	Date:	9/4/2009

Purpose: Select the pump for transfering water to backwash greensand filters

Design flow rate: 190 gpm

Calculation of head loss :

Head loss (system) = hz + h_f + h_p

where: h_z = Elevation head (ft)

h_f = Head loss due to pipe/fittings (ft)

h_p = Pressure head (ft)

1. Calculate elevation head h_z :

Low water level in effluent tank =	1.5 ft above ground
High water level in effluent tank =	8.3 ft above ground
Elevation of Greensand backwash waste Pipe =	13 ft above ground
Maximum elevation head =	11.5 ft
Minimum elevation head =	4.7 ft

2. Calculate friction loss

Assume 4 inch PVC pipe

Assume 4 inch PVC pipe length is 100 ft

Fittings	Quantity	eq. length ft	total eq. length ft
Check valve	1	151.1	151.1
90° standard elbows	20	16.8	336
Standard Tee	6	22.1	132.6
Total Equivalent Length of fittings			619.7

Total length of pipe 719.7 ft

Calculate friction loss using Hazen-William's equation

$Hf = 3.022 * v^{1.85} * L / (C^{1.85} * D^{1.17})$

For PVC pipe C= 130

Hf	Q	v	D	L
ft	gpm	ft/sec	ft	ft
8.90	190	4.9	0.33	719.7

3. Calculate pressure head

Pressure required by greensand units during backwash: 10 psi
23 ft

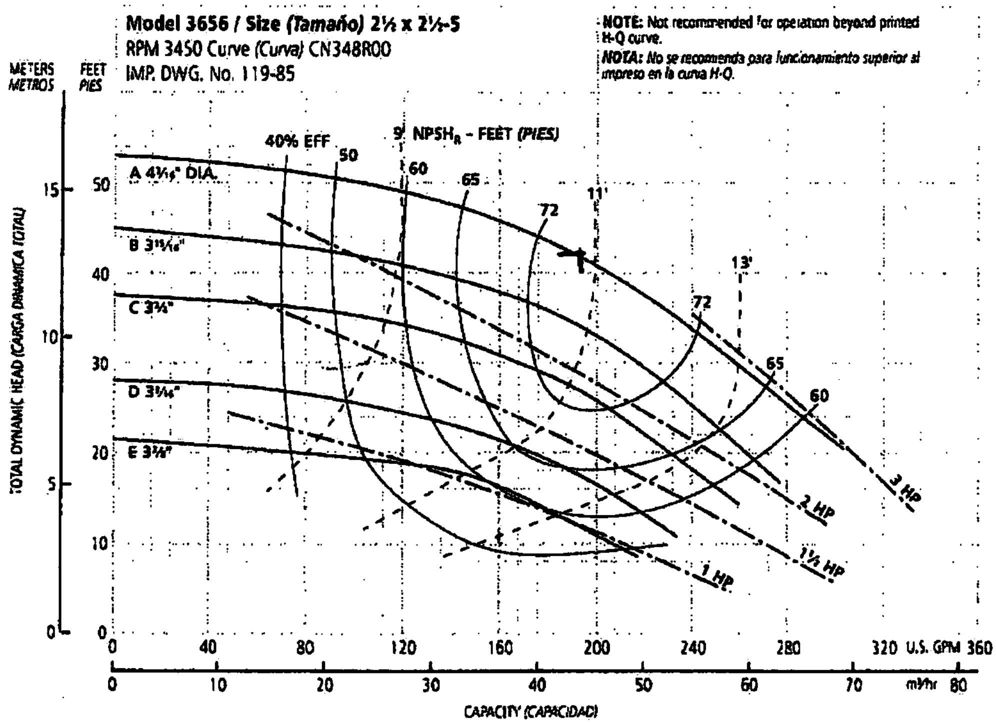
Maximum static head is	34.5
Minimu static head is	27.7
Flow rate (gpm)	190
Maximum total dynamic head	43.40
Minimum total dynamic head	36.60

Select Goulds Pump
Model 3656 M&L 52AL1H2A0
230 Volts, 3 phase, 3 hp
Suction connection 2-1/2"; discharge connection 2-1/2".

P-5

Transfer pump for greensand filter backwash

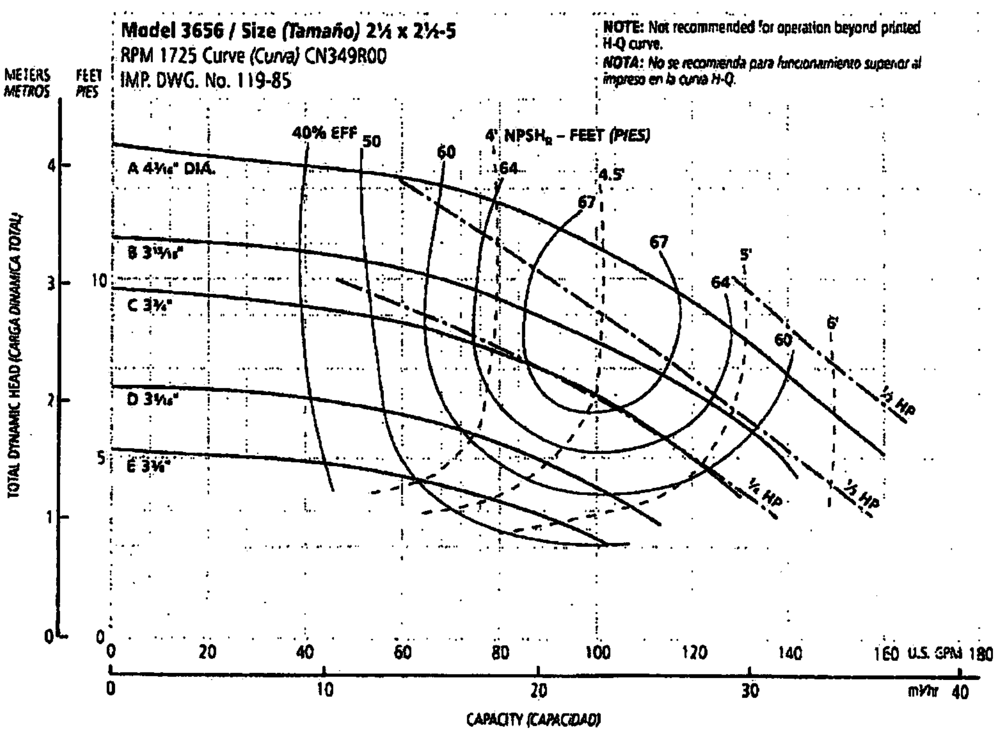
Performance Curves
Curvas de Funcionamiento



Optional Impeller *Impulsor optativo*	
Ordering Code *Código de pedido*	**Dia.** *Diá.*
A	4⁷⁄₁₆"
B	3¹⁵⁄₁₆
C	3¾
D	3⁵⁄₁₆
E	3⅛

NOTE: Pump will pass a sphere to ⁵⁄₃₂" diameter.

***NOTA:** La bomba dejará pasar una esfera de hasta ⁵⁄₃₂ de pulgada de diámetro.*



Optional Impeller *Impulsor optativo*	
Ordering Code *Código de pedido*	**Dia.** *Diá.*
A	4⁷⁄₁₆"
B	3¹⁵⁄₁₆
C	3¾
D	3⁵⁄₁₆
E	3⅛

NOTE: Pump will pass a sphere to ⁵⁄₃₂" diameter.

***NOTA:** La bomba dejará pasar una esfera de hasta ⁵⁄₃₂ de pulgada de diámetro.*

A Full Range of Product Features
Una Gama Total de Características del Producto

The 3656LH and 3756LH pumps from Goulds Pumps have been designed with technical benefits to meet the needs of both manufacturers and users in a variety of refrigeration and cooling applications as well as irrigation applications.

- Performance testing of every pump we manufacture assures trouble free operation.
- Back pull-out to reduce maintenance down time.
- Standard John Crane Type 21 mechanical seal for both reliability and availability.
- Available in all iron or bronze fitted construction for application versatility.
- Replaceable wearing components include stainless steel shaft sleeve and casing wear ring to maintain peak efficiency.
- Enclosed impeller design, dynamic balancing and renewable wear ring reduce losses affecting performance and pump life.
- Suction and discharge connections are NPT threaded except for the 4 x 4-5 and 5 x 5-6 sizes which have ANSI class 125 flat faced flanges.
- Casing mounting is standard with a vertical discharge however can be rotated in 90 degree increments for side discharge arrangements.

Las bombas 3656LH y 3756LH de Goulds Pumps han sido diseñadas con beneficios técnicos para cumplir con las necesidades de fabricantes y usuarios en una variedad de aplicaciones para refrigeración y enfriamiento, además de aplicaciones de irrigación.

- *Pruebas de funcionamiento de cada bomba que fabricamos, aseguran un funcionamiento sin problemas.*
- *Extracción trasera para reducir el tiempo de mantenimiento.*
- *Sello mecánico estándar John Crane Tipo 21 para funcionalidad y disponibilidad.*
- *Disponibles en todas las construcciones de hierro o recubiertas de bronce para variedad de aplicaciones.*
- *Componentes reemplazables sujetos a desgaste incluyen camisas de eje de acero inoxidable y anillos de desgaste de la carcasa para mantener un rendimiento óptimo.*
- *Las conexiones de succión y descarga son NPT roscadas, excepto por los tamaños de 4 x 4-5 y 5 x 5-6 que tienen bridas de cara plana ANSI Clase 125.*
- *El montaje de la carcasa es estándar con una descarga vertical; sin embargo, se puede rotar en incrementos de 90 grados para disposiciones de descarga lateral.*

3656LH, 3756LH Numbering System
3656LH, 3756LH Sistema de Numeración

The various versions of the 3656LH and 3756LH are identified by a product code number on the pump label. This number is also the catalog number for the pump. The meaning of each digit in the product code number is shown below.

Las diferentes versiones de las 3656LH y 3756LH se identifican con un número de código del producto en la etiqueta de la bomba. Este número es también el número de catálogo para la bomba. El significado de cada dígito en el número de código del producto se muestra abajo.

Example Product Code,
Ejemplo Código del Producto

51 BF 1 F 2 B 0

Mechanical Seal and O-ring,
Sello Mecánico y Anillo 'O'

Seal Code, *Código del Sello*	Rotary, *Rotativo*	Stationary, *Estacionario*	Elastomers, *Elastómeros*	Metal Parts, *Partes Metálicas*	Part No., *Pieza Número*
0	Carbon	Ceramic, Cerámica	BUNA	Type 316 SS, *Tipo 316 SS*	10K13
1		Sil-Carb., Caburo de silicona	EPR		10K19
3			Viton		10K27
5	Sil-Carb.				10K64

Note: 10K27 replaces obsolete 10K25,
***Nota:** La 10K27 reemplace la obsoleta 10K25.*

Impeller Option Code,
Código del Impulsor Opcional

Impeller Code, *Código del Impulsor*	Pump Size, *Tamaño de la Bomba* 2x2–5 Dia.	2½x2½–5 Dia.	3x3–5 Dia.	4x4–5 Dia.	5x5–6 Dia.
A	4"	4 3/16"	4 3/8"	4 1/4"	5 1/2 x 4 1/2"
B	3 3/4	3 15/16	4 3/16	4 5/8	5 5/16 x 4 5/16
C	3 1/2	3 3/4	4	4 1/2	5 x 3 7/8
D	3 1/4	3 9/16	3 13/16	4 3/16	5 x 3 9/16
E	3	3 3/8	3 5/8	4	5 x 3 11/32

Driver, *Conductor*
1 = 1 PH, ODP 6 = 575 V, TEFC
2 = 3 PH, ODP 7 = 3 PH, XP
3 = 575 V, ODP 8 = 575 V, XP
4 = 1 PH, TEFC 9 = 3 PH, TEFC, PREFF.
5 = 3 PH, TEFC 0 = 1 PH, XP

HP Rating, *HP Potencia*
C = 1/2 E = 1 G = 2 J = 5 L = 10
D = 3/4 F = 1 1/2 H = 3 K = 7 1/2 M = 15

Replace with "FRM" for 3756LH
Reemplace con "FRM" para 3756LH

Driver: Hertz/Pole/RPM,
Conductor: Hercios/Polo/RPM
1 = 60 Hz, 2 pole, 3500 RPM
2 = 60 Hz, 4 pole, 1750 RPM
3 = 60 Hz, 6 pole, 1150 RPM
4 = 50 Hz, 2 pole, 2900 RPM
5 = 50 Hz, 4 pole, 1450 RPM

Material
AI = All iron, *Todo hierro*
BF = Bronze fitted, *Recubiertas de bronce*

Pump Size, *Tamaño de la Bomba*
51 = 2 x 2 – 5
52 = 2½ x 2½ – 5
53 = 3 x 3 – 5
54 = 4 x 4 – 5
55 = 5 x 5 – 6

Sludge Pump P-4

Calculated by:	G. Chen	Date:	8/31/2009
Reviewed by:	J. Ma	Date:	9/4/2009

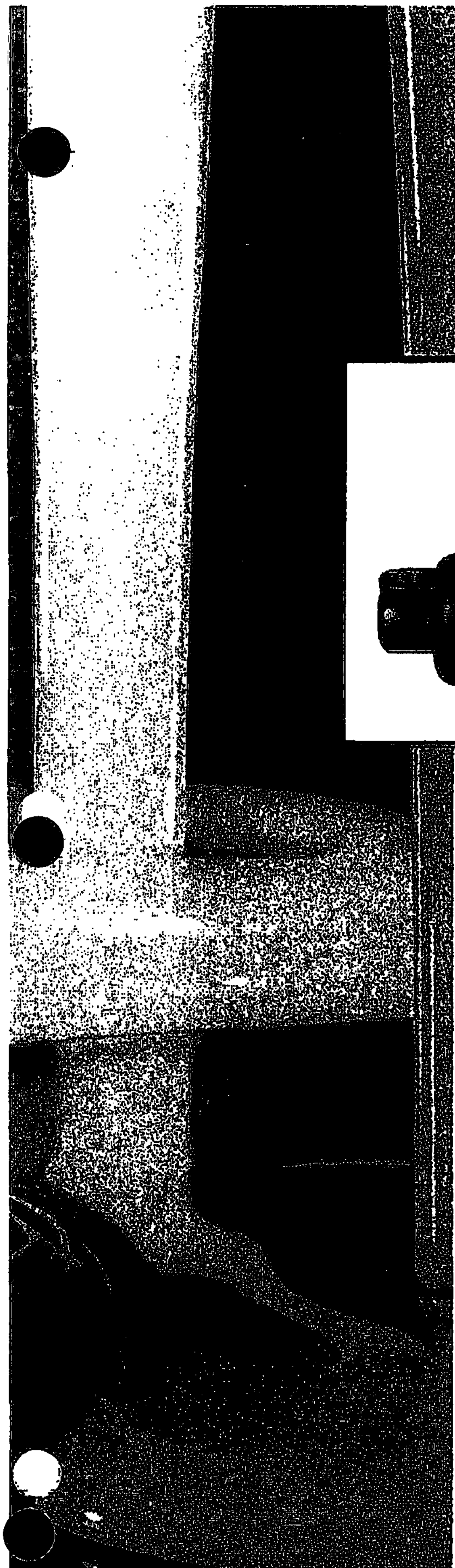
Purpose: Select sludge pump to transfer iron sludge from sludge settling tank to sludge holding tank

Total volume to be transferred 100 to 320 gallon within one hour

Maximum head 13 feet

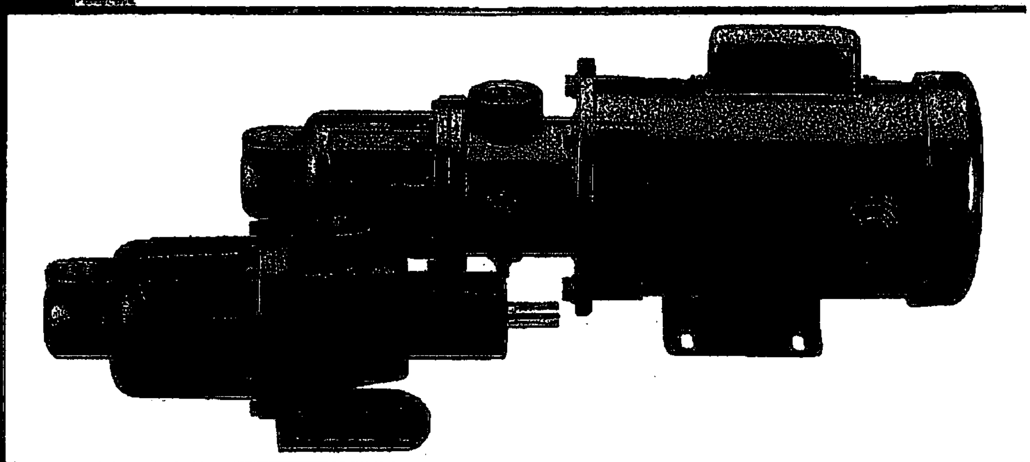
A progressive cavity pump is selected, Moyno 500 pumps, 300 seroes, Model 33360 at 23 feet, pumping rate is 8.4 gpm

pumping time for 320 gallon would be 38 minutes



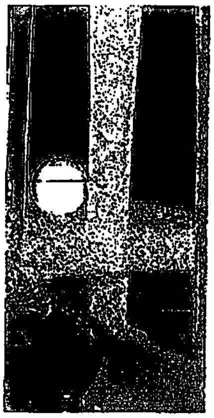
MOYNO® 500

Progressing Cavity Pumps



MOYNO

Always the Right Solution™



Moyno® 500 Pumps:
Outstanding Benefits for Unsurpassed Value!

Why choose Moyno 500 pumps over other pumps for commercial and general purpose industrial applications? The answer lies in the many benefits Moyno 500 pumps offer – an outstanding combination of performance enhancing advantages that other types of pumps simply cannot match. Here are just some of the benefits you can enjoy with Moyno 500 pumps:

- **Assure yourself of proven pump design.** Moyno 500 pumps are pre-engineered and thoroughly tested, with designs that have proven themselves in scores of applications year after year. With Moyno 500 pumps, you know up front that they will perform for you.

- **Match your pump precisely to its application.** Over 70 Moyno 500 pump models are available, in a variety of construction materials, with many pump options. This broad offering allows you to "tailor" a Moyno 500 pump to the specific needs of your application.

- **Place your pump where you need it the most.** Moyno 500 pumps combine high performance with efficient size. These compact, lightweight pumps fit in tight or difficult spaces, giving you more installation flexibility.

- **Use the pump drive source of your choice.** Moyno 500 pumps are available in both motorized models and non-motorized versions that work with various drive sources. You not only choose the pump you need, you also choose how to power it.

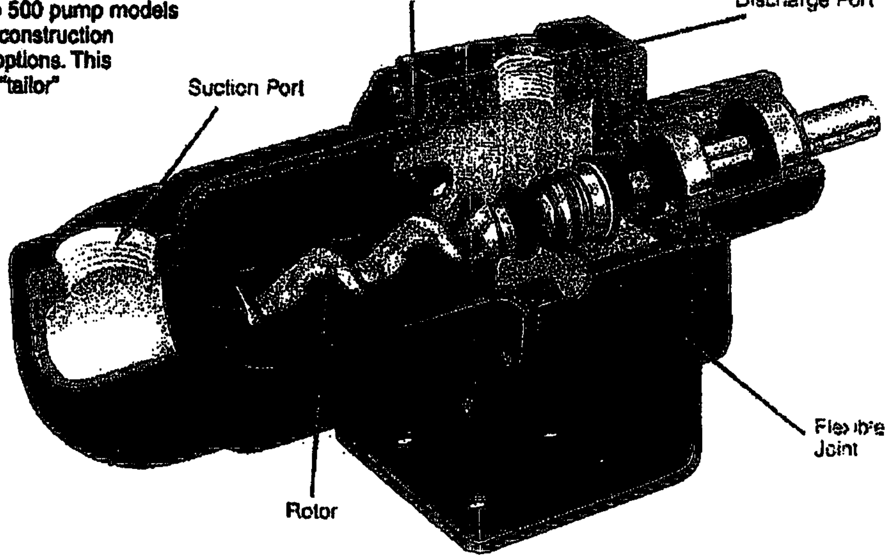
- **Eliminate priming.** As long as there is material in the suction line, Moyno 500 pumps are self priming.

- **Eliminate excessive operating noise.** Moyno 500 pumps operate quietly...the only sound you hear is the low hum of the drive motor. That makes it comfortable to work around a Moyno 500 pump installation. It also contributes to the overall quiet operation of OEM equipment into which the pump is installed.

- **Ensure steady, repeatable flow.** Moyno 500 pumps provide accurate, repeatable, non-pulsating, low-shear flow which remains steady even under wide variations in suction head.

- **Reduce pump maintenance.** With premium components, you rarely need to repair a Moyno 500 pump. When you do, design simplicity allows you to make the repairs quickly using standard tools. There are no valves to stick or wear out and no timing gears to align, saving you time and money.

- **Use the same pump for different applications.** For ultimate versatility, you can use the Moyno 500 pump in a wide variety of applications. Whether you are pumping clean, clear liquids or viscous, abrasive, corrosive or solids-laden fluids, the Moyno 500 pump can handle the job.



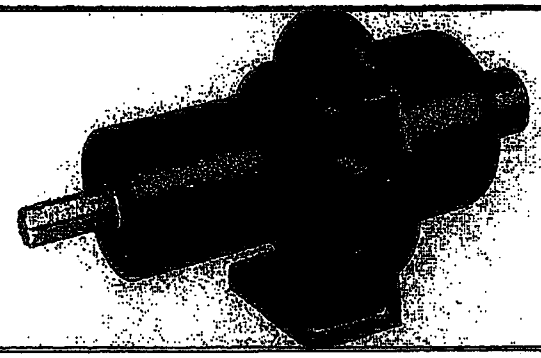
- **Access industry-leading technology.** Choosing Moyno 500 pumps means access to Moyno's state-of-the-art manufacturing and developmental lab facilities plus nearly 60 years of progressing cavity pump design innovation. The result is product performance reliability you can depend on time after time.

- **Receive full-service support from local stocking distributors.** Moyno maintains a worldwide network of stocking distributors ready to assist you with applications information, product knowledge and extensive pump and replacement parts inventories. You receive fast, accurate solutions to your pumping needs. Your Moyno 500 pump receives first-rate support, no matter where you are located.

The Moyno® 500 Pump Line

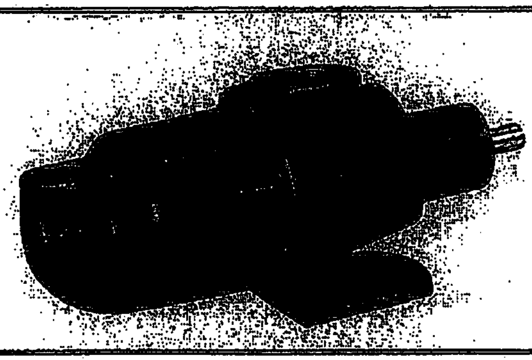
200 Series Pumps

- Capacities to 5 GPM
- Pressures to 40 PSI
- Compact size
- Motorized and non-motorized models
- Dual, heavy-duty ball bearings, fully sealed and pre-lubricated
- Mechanical seal



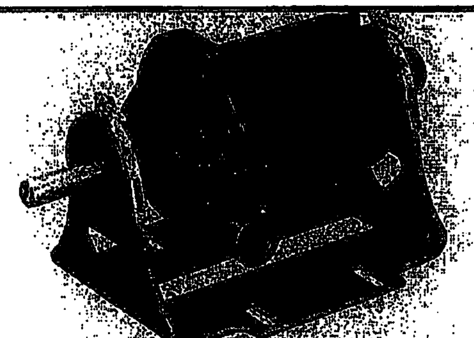
300 Series Pumps

- Capacities to 15 GPM
- Pressures to 150 PSI
- Interchangeable rotors and stators
- Fluid temperature range to 210°F
- Packing gland or mechanical seals available
- Motorized and non-motorized models available



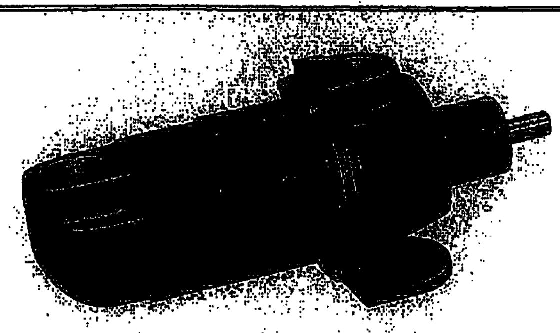
301 Series Pumps

- Capacities to 13 GPM
- Pressures to 25 PSI
- Phenolic housing and rotor for chemical corrosion resistance
- Reverse covered seal between rotor and shaft eliminates metal exposure to fluids
- Non-motorized with hose connections, resilient cushion and cradle mounting



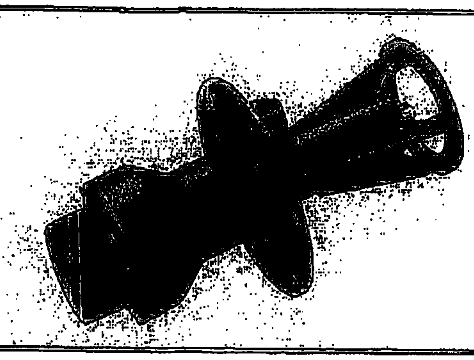
356/367 Series Pumps

- Capacities to 50 GPM
- Pressures to 50 PSI
- Full range of elastomer materials
- Fluid temperatures to 240°F
- Packing and mechanical seals available
- Motorized and non-motorized models available



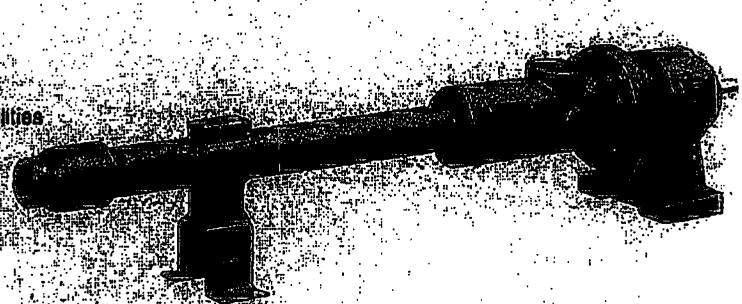
400 Series Grinder Pumps

- Capacities to 15 GPM
- Discharge to 100 PSI
- Cast iron cutter disk
- Replaceable carbide cutting tips
- Hardened tool-steel cutter ring



600 Series Pumps

- Capacities to 30 GPM
- High pressure and fluid viscosity capabilities
- Pressures to 600 PSI
- Reverse operation capability
- Packing or mechanical seals available



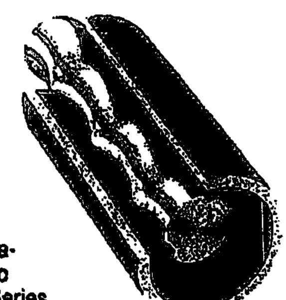
How Moyno 500 Pumps Work

The progressing cavity design forms a series of sealed cavities 180 degrees apart. These cavities contain the pumped fluid. As the rotor turns, the cavities "progress" from the suction to the discharge end of the pump, carrying the pumped fluid with them. As one cavity decreases and empties itself of fluid, the opposite cavity increases at exactly the same rate, filling with fluid. The result is a constant, uniform, non-pulsating flow that provides low shearing action for minimum degradation of shear-sensitive materials and low velocity capabilities for effective pumping of viscous fluids.

"Wobble" Stators

Most Moyno 500 pumps are equipped with an innovative "wobble" stator, a fully molded stator with an integral "skirt" separating the suction and discharge ends of the pump. This unique design actually increases the compression fit during operation between rotor and stator, for greater pumping performance. The wobble stator design can handle pressures to 150 PSI and is available on the Series 200, 300, 301, 356/367 and 400 pumps.

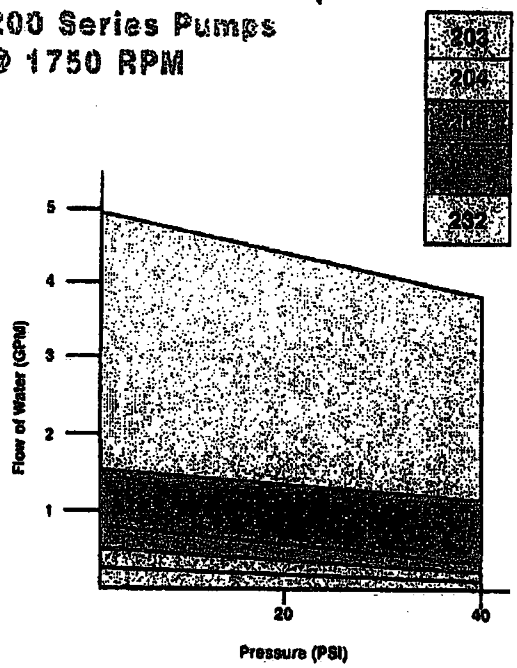
"Tube" Stators



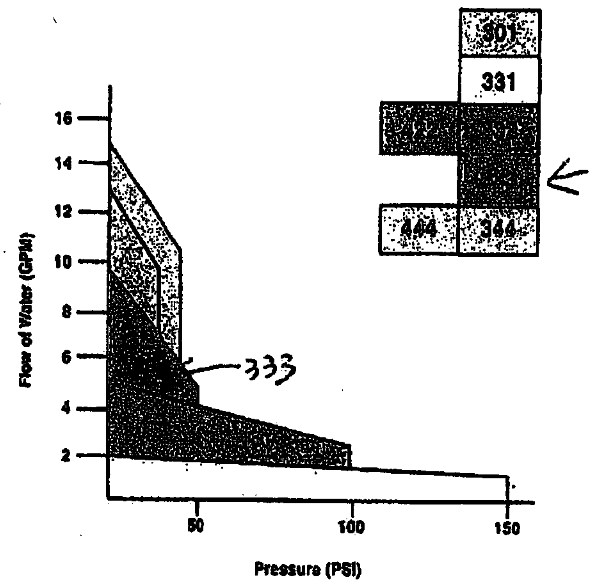
Moyno 500 pumps with a tube-type stator design can easily handle high-pressure pumping of heavy-duty industrial fluids. The tube-type design permits additional length to be added, increasing pressure capabilities for greater operating efficiencies. The tube stator design can handle pressures to 600 PSI, and is available on the Series 600 pumps.

Moyno® 500 Pump Performance

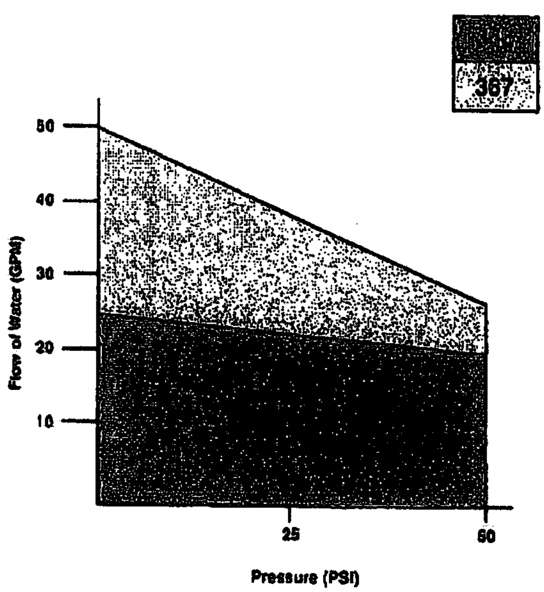
Performance Envelope 200 Series Pumps @ 1750 RPM



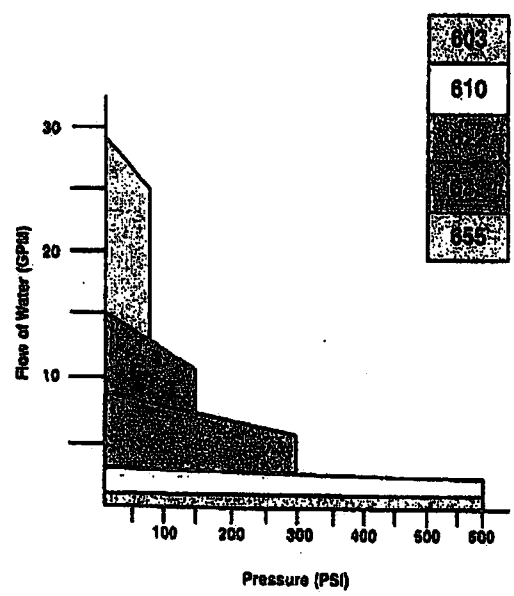
Performance Envelope 300/400 Series Pumps @ 1750 RPM



Performance Envelope 356/367 Series Pumps @ 1750 RPM



Performance Envelope 600 Series Pumps @ 1750 RPM



Application Versatility ... From A to Z

Versatile Moyno® 500 pumps are used in these and hundreds of other applications...

Abrasive chemicals and slurries
Agricultural spray wash systems
Airless paint sprayers
Anti-freeze lubricants
Asphalt transfer

Batching systems
Bilge pumps
Boat and barge duty
Boiler feed (low pressure)
Bridge deck flooding

Campground facilities
Caulking
Centrifugal priming, scavaging and seal flush systems
Closed loop cooling systems
Construction applications

Dairy applications
Dental suction
Dirty oil
Drainage
Drum transfer

EDM dielectric fluids
Effluent sampling
Emulsions
Emergency drainage
Explosives

Fabric coatings
Feed additives
Fiberboard manufacturing
Filtration systems
Fuel transfer

Garbage disposal
Glue
Grain mash slurries
Grout
Gum and wood chemicals

Heat pump supply
Heat exchanger service
Heavy crude
High-pressure feed/transfer systems
Home applications

Industrial circulation and transfer
Industrial waste and sewage sampling
Ink
Insecticides

Jet fuel

Kerosene
Kitchen waste
Knit fabric mills

Laboratory testing
Lime slurries
Liquid aluminum
Liquid manure
Lubricants

Machine tool coolants
Marine septic systems
Metered injection systems
Mining operations
Molasses based feeds

Nitric acid
Non-ferrous metal
Nutrient additives

OEM applications
Offshore drilling
Oil and sand
Oil scum
Oily water separators

Paint
Pilot and prototype systems design
Pit de-watering
Polymer treatment

Radar equipment
Raw and digested sewage
Recreational facilities
Reverse osmosis systems
Roofing compounds

Saline solution (hemodialysis machines)
Slurries (high solids content)
Spraying systems
Sump pump-out
Swimming pool drainage

Tank sump cleaning
Thickened underflow
Titanium dioxide
Toner
Transfer applications

Urine (agriculture)

Vehicle wash down

Waste management
Wastewater treatment
Water and sewage sampling

Zebra mussel removal

For information about Moyno products or for technical assistance, write or call:

Moyno, Inc.
P.O. Box 960
Springfield, OH 45501-0960
U.S.A.
Telephone: 1-877-4UMOYNO
Facsimile: 937-327-3572
Web site: www.moyno.com

Note: Information contained herein is subject to change without notice. Before making a final product selection, please contact a Moyno representative.

Your Moyno Authorized Distributor is:

Bulletin 90-M

MOYNO

Always the Right Solution™

Printed in U.S.A.
5M PPI 1201

MOYNO

Always the Right Solution™

SPECIFICATION DATA

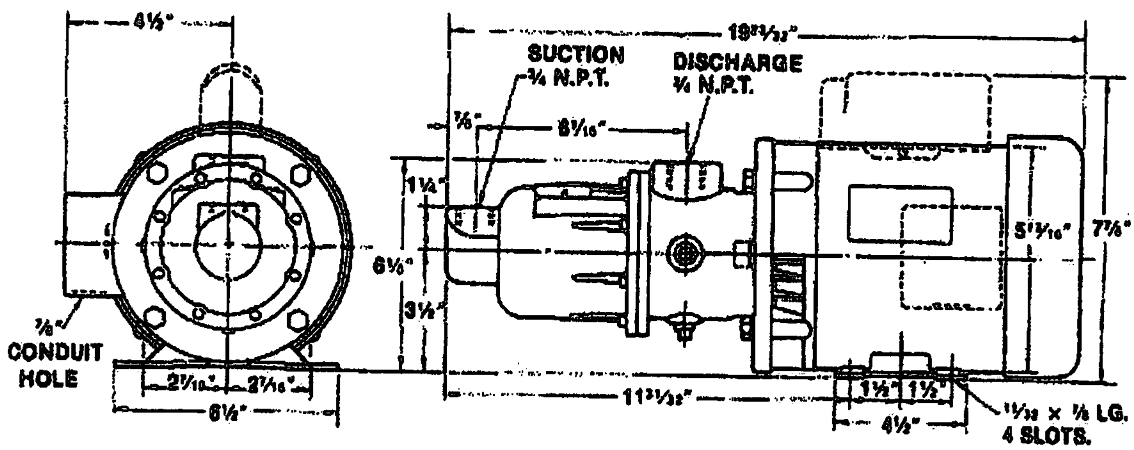
MOYNO® 500 PUMPS

300 SERIES MOTORIZED

331, 332, 333, 344, 356 AND 367 MODELS

331, 332, 333, 344 MODELS

DIMENSIONS

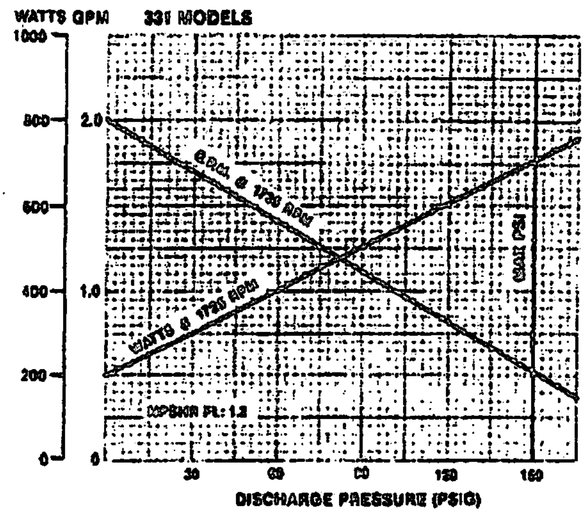


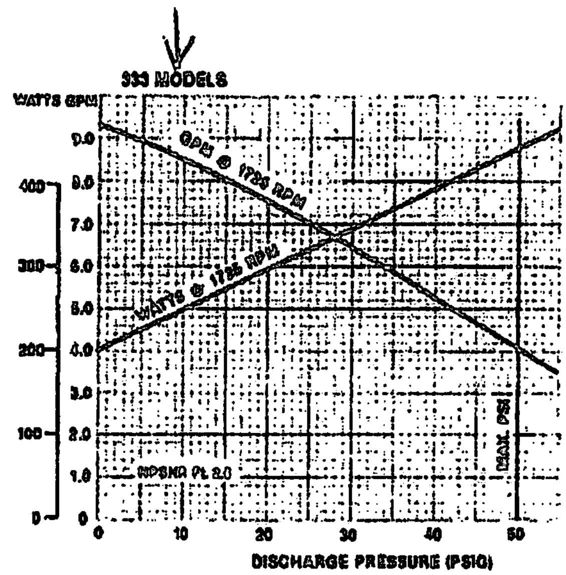
MATERIALS OF CONSTRUCTION

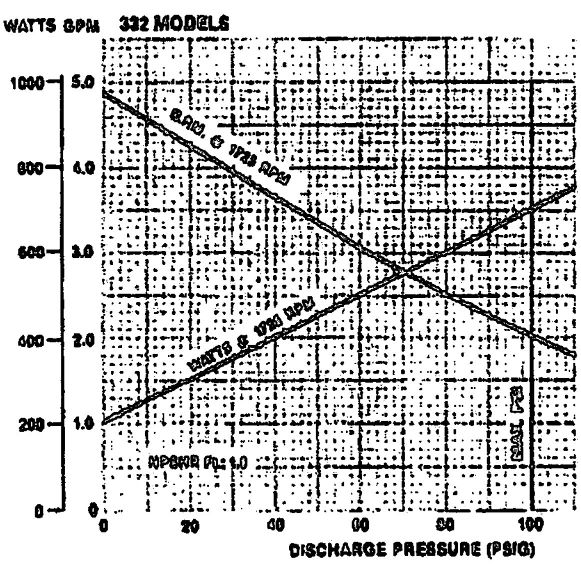
COMPONENT	MODELS			
	33159, 33259 33359, 34459	33160, 33260 33360, 34460	33152, 33252 33352, 34452	33150, 33250 33350, 34450
Housing Rotor Stator	Cast iron 416 SS/CP NBR (Nitrile)	Cast iron 416 SS/CP NBR (Nitrile)	316SS 316 SS/CP NBR (Nitrile)	316SS 316 SS/CP NBR (Nitrile)
Motor Data	1/2 HP,1 PH 115/230 VAC 60 HZ TEFC	1/2 HP, 3 PH 230/440 VAC 60 HZ TEFC	1/2 HP, 1 PH 115/230 VAC 60 HZ TEFC	1/2 HP, 3 PH 230/440 VAC 60 HZ TEFC
Weight (lbs)	41	41	41	41

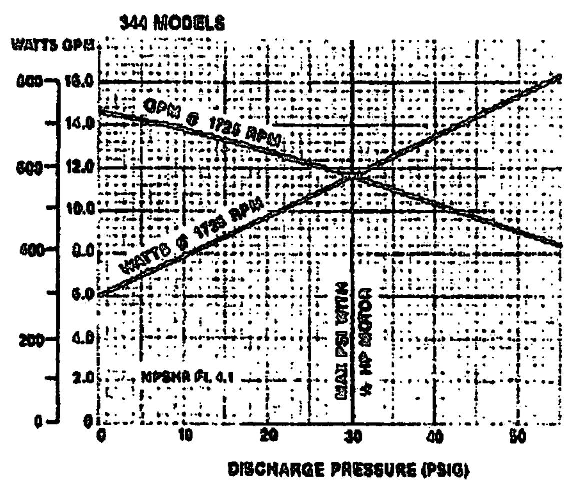
CP = Chrome plated

PERFORMANCE (Water at 70°F)









NOTE: With the standard 1/2 HP motor, maximum fluid viscosity is 100 CP (500 SSU).

Sump Pump SMP-1

Calculated by:	G. Chen	Date:	8/18/2008
Reviewed by:	J. Ma	Date:	9/11/2008

Purpose: Calculate requirements for capacity and head, and select pump in containment sump

Approach:
1. Calculate the capacity and head requirements
2. Select appropriate pump

The sump will have dimension of 3' wide X 3' deep X 3' long with with 6" of freeboard, a maximum capacity of

V =3' x 3' x 2.5' = 22.5 ft^3 168.32 gallons

Water from the sump will be pumped to the top of equalization tank T -1.

Calculation of head loss :

Head loss (system) = hz + h_f + h_p

where: h_z = Elevation head (ft)
h_f = Head loss due to pipe/fittings (ft)
h_p = Pressure head (ft)

1. Calculate elevation head h_z :

Usually, a suction pump has a minimum pumping level of 6 inches.
Suction lift below grade hz1 = 2.5 ft
Height of feed pipe to the equalization tank hz2= 12 ft
Total elevation head h_z = **14.50 ft**

2. Calculate head loss due to pipe/fittings: h_f

$h_f = h_{f\,(pipe)} + h_{f\,(fittings)}$

Calculate head loss due to pipe
$h_{f\,(pipe)} = L x\, h_{L\,(pipe)}$, where L = total length of the pipe (ft)
h_L (pipe) = pipe friction loss

Assume a full sump will be pump empty in 10 minutes
Q = V_{sump} / Time 16.8 gal/min

Estimated length of piping 82 ft

Equivalent length of fittings

Fittings	L_{eq}	Quantity	
Check valve	25.5	1	25.5
Ball valve	1	1	1
90° street elbows	8.6	4	34.4
	Equivalent length of all fittings		60.9

Calculate friction loss using Hazen-William's equation

$Hf = 3.022 * v^{1.85} * L / (C^{1.85} * D^{1.17})$

For PVC pipe C= 130

Hf	Q	v	D	L
ft	gpm	ft/sec	ft	ft
1.62	20	2.0	0.17	142.9

Total dynamic head = **16.12** ft

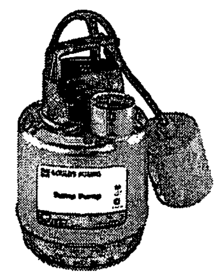
Pump Selected	
Goulds Pump LSP03	1/3 hp, 115 Volts, 2.9 amps
	1 1/2" discharge connection

ITT

Wastewater

Goulds Pumps

LSP03/LSP07 Submersible Sump Pumps



LSPO3AT

LSPO3AV

LSPO7

GOULDS PUMPS

Goulds Pumps is a brand of ITT
Residential and Commercial Water.

www.goulds.com

Engineered for life

FEATURES

- Corrosion-resistant construction.
- Stainless Steel motor casing and fasteners.
- Glass-filled thermoplastic impeller and casing.
- Upper and lower heavy duty ball bearing construction.
- Motor is permanently lubricated for extended service life and is powered for continuous operation. All ratings are within the working limits of the motor.
- Hard coated 400 series stainless steel shaft for improved corrosion resistance.
- Float switch is adjustable for various liquid levels. Easily removed for direct pump operation or switch replacement.
- Complete unit is lightweight, portable and easy to service.
- Available in manual and automatic versions. See next page for specific order numbers.
- A double labyrinth lip seal system protects the motor. It consists of three lip seals and a V-ring in addition to an impeller counterblade system which keeps solid particles away from the seal unit.

ITT

GOULDS PUMPS
Wastewater

APPLICATIONS

Specially designed for the following uses:
- Basement draining
- Water transfer
- Dewatering

SPECIFICATIONS

- Discharge size: 1 ½" NPT.
- Capacities: to 57 GPM.
- Maximum head: 34 feet TDH.
- Max. solids: ⅜" spherical
- Temperature: 104°F (40°C) maximum liquid temperature.
- Maximum pump submergence is 10 ft. for LSP03; 16 ft. for LSP07.

MOTOR

- Single phase, 3450 RPM, 60 Hz
  - LSP03, ⅓ HP, 115 V, 2.9 maximum amps.
  - LSP07, ¾ HP, 115 V (7.1 amps) or 230 V (3.5 amps).
- Built-in thermal overload protection with automatic reset.
- Permanent-split-capacitor type.
- Class B insulation.
- Stainless steel shaft.
- Air filled design.
- Power cord length: LSP03; 10 feet standard, 20 feet optional, LSP07; 20 feet.

FLOAT SWITCH OPTIONS

- ☐ Models are available with a float switch. Several options for automatic operation.
- ☐ "AV" models are supplied with a vertical float switch.
- ☐ "A" models are supplied with a built in float switch.
- ☐ "AT" models are supplied with a piggy-back replaceable float switch.

AGENCY LISTING

Canadian Standards Association
File #LR114251

Underwriters Laboratories
File #83318

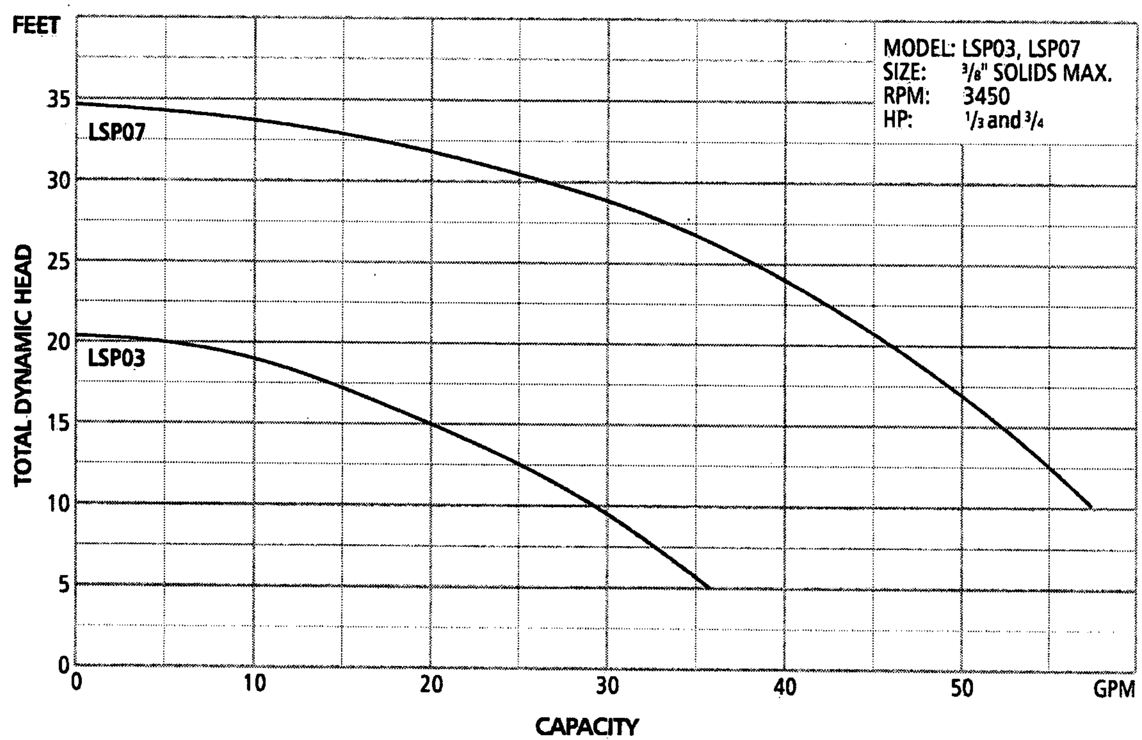
Goulds Pumps is ISO 9001 Registered.

MODEL INFORMATION

Order No.	HP	Volts	Amps	Minimum Circuit Breaker	Phase	Float Switch Style	Cord Length	Discharge Connection	Min. On Level	Min. Off Level	Minimum Basin Diameter	Maximum Solids Size	Shipping Weight lbs/kg
LSP0311						Plug / No Switch			Manual	Manual	9"		
LSP0311A						Built-In Wide Angle	10'		11"	5"	12"		
LSP0311AT						Piggyback Wide Angle			11"	5"	12"		
LSP0311AV	⅓	115	2.9	10	1	Piggyback Vertical		1½"	8.5"	2"	12"	⅜"	11 / 5
LSP0311F						Plug / No Switch			Manual	Manual	9"		
LSP0311AF						Built-In Wide Angle	20'		11"	5"	12"		
LSP0311ATF						Piggyback Wide Angle			11"	5"	12"		
LSP0711F						Plug / No Switch			Manual	Manual	9"		
LSP0711AF		115	7.1			Built-In Wide Angle			12.5"	6.5"	12"		
LSP0711ATF	¾			10	1	Piggyback Wide Angle	20'	1½"	12.5"	6.5"	12"	⅜"	15 / 6.8
LSP0712F						Plug / No Switch			Manual	Manual	9"		
LSP0712AF		230	3.5			Built-In Wide Angle			12.5"	6.5"	12"		
LSP0712ATF						Piggyback Wide Angle			12.5"	6.5"	12"		

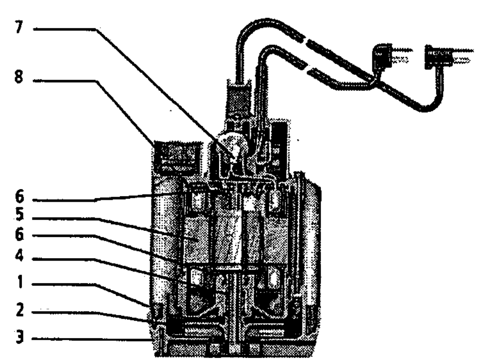
ITT

GOULDS PUMPS
Wastewater



COMPONENTS

Item No.	Description
1	Casing
2	Impeller
3	Suction strainer
4	Shaft seal with cover
5	Motor
6	Ball Bearing
7	Capacitor
8	O-ring



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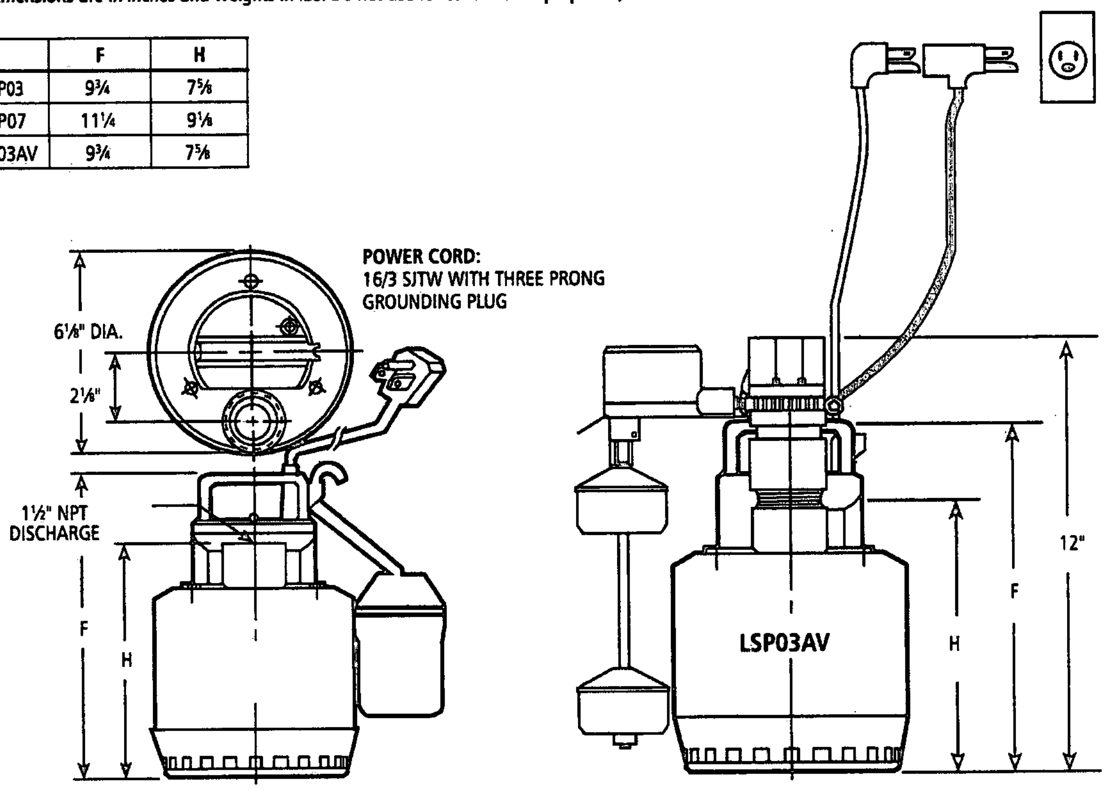
Wastewater

DIMENSIONS

(All dimensions are in inches and weights in lbs. Do not use for construction purposes.)

	F	H
LSP03	9¾	7⅝
LSP07	11¼	9⅛
LSP03AV	9¾	7⅝



GOULDS PUMPS

Goulds Pumps and the ITT Engineered Blocks Symbol are registered trademarks and tradenames of ITT Corporation.

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

BLSP03 August, 2006

Engineered for life

Tanks

Calculated by:	G. Chen	Date:	8/12/2008
Checked by:	CJ	Date:	9/3/2009

1 Equalization tank

a. Without iron removal system

Desing influent flow rate =	200 gpm
Maximum flow rate =	250 gpm
Assume 10 minutes retention time	
Influent buffering volume =	2,000 gallon
Maximum buffering volume =	2,500 gallon

b. With greensand filters for Iron Removal

Based on manufacture information, 85% water during each backwash could be recirculated from sludge setting tank to influent tank

if backwash rate is 12 gpm/sq. ft.	
recirculated supernatant volume =	1,738 gallon
If backwash rate is 14 gpm/sq. ft.	
recirculated supernatant volume =	2,010 gallon

Assume each filter will be backwashed once a day and recirculated water would be redistributed within 6 hours flow rate = 5.6 gpm

c. Total effective volume in equalization tank (including iron treatment system) 4,510 gallons

Assume tank diameter is	10 feet
required height of the tank =	7.7 feet

the lowest water level is 0.8 feet from tank bottom
overflow is 0.5 foot from the top of the required height
another 0.5 foot above overflow pipe as free board

Select a **5,600 vertical tank** to be the influent tank,

2 Sludge settling tank

check 250 gpm influent rate

Total volume discharged due to backwash cycle =		2045 gallons
Assume settling tank diameter	D =	10 ft
Settling tank required depth	h =	3.5 ft

Assume sludge discharged from sludge settling tank to sludge holding tank has 1% solid

Volume of sludge pumped out for each backwash	150 gallons	(see solid calc)
Supertatent recirculated to equalization tank	1895 gallon per backwash per unit	

Select a **5,500 gallon cone bottom tank** for sludge settling.

3 Sludge holding tank

Assume 100 to 320 gallon of sludge per backwash is discharged to the sludge holding tank

Minimum volume of sludge generated per day is approximately	150 gallons
Maximum volume of sludge generated per day is approximately	450 gallons
Volume generated per week =	3150 gallons

Select a **5,500 gallon cone bottom tank** as sludge holding tank.

Calculated by:	G. Chen	Date:	8/12/2008
Checked by:	CJ	Date:	9/3/2009

4 Clear water tank

Standard volume for backwash	1910 gallons
Maximum volume for backwash	2230 gallons

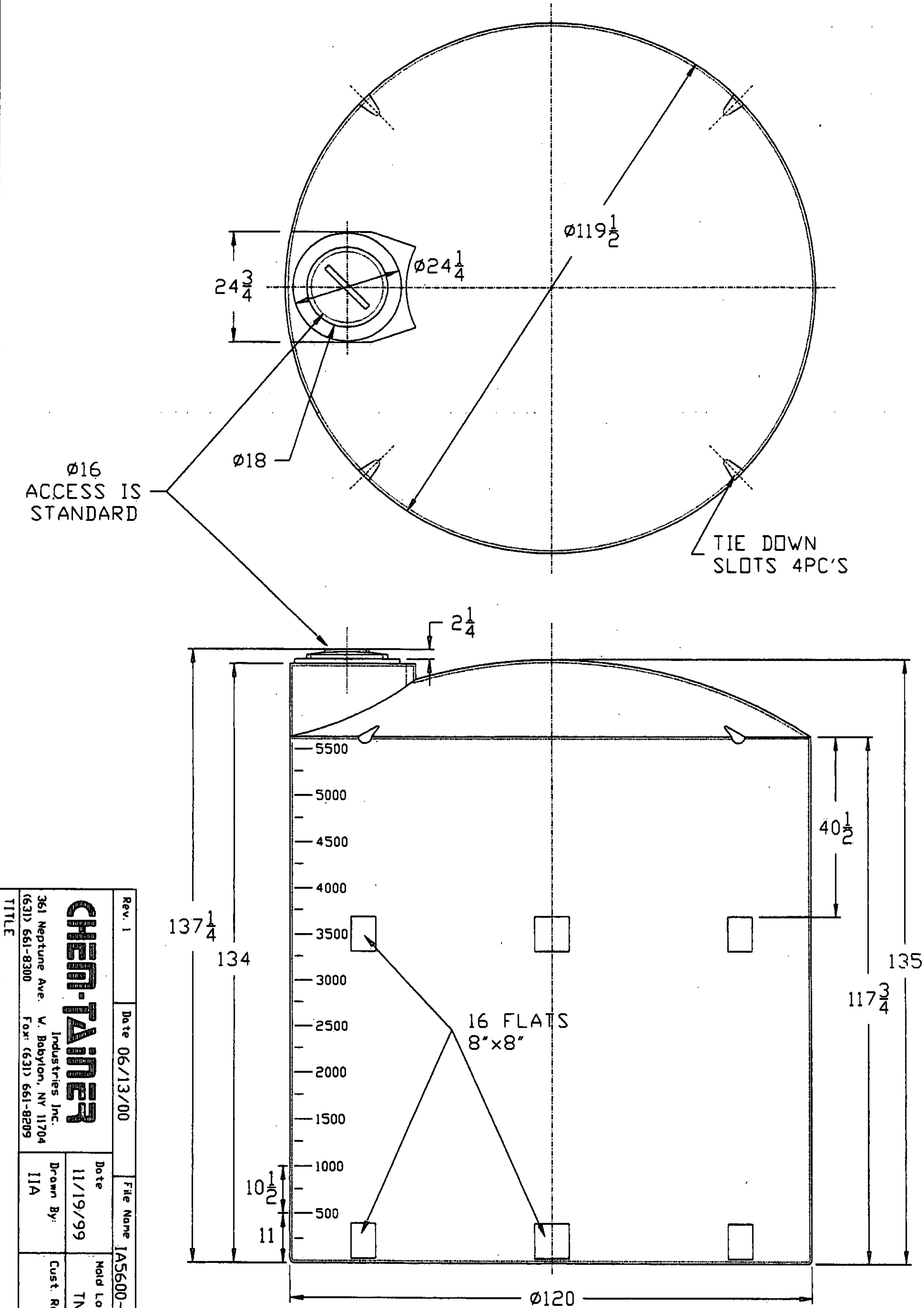
assume the diameter of the tank is	7.5 feet
Required height of the tank	6.8 feet
Low water level is set at 1 foot from bottom	1 feet
Free board level is set at 1 foot higher than required heigl	1 feet
total height of the tank	8.8 feet

A **3,000 gallon tank** is selected, diameter 7.5 feet, straight height 8.7 feet, final tank height 9.8 feet.

5 chemical storage tank

Assume the sodium hydroxide and sodium hypochlorite storage tanks are refilled monthly, **300 gallon** tanks are selected.

Equalization tank



ALL DIMENSIONS SHOWN ARE OUTSIDE PART DIMENSIONS IN INCHES, AND VARY BY THE STANDARD ROTATIONAL MOLDING TOLERANCE OF ±2%.

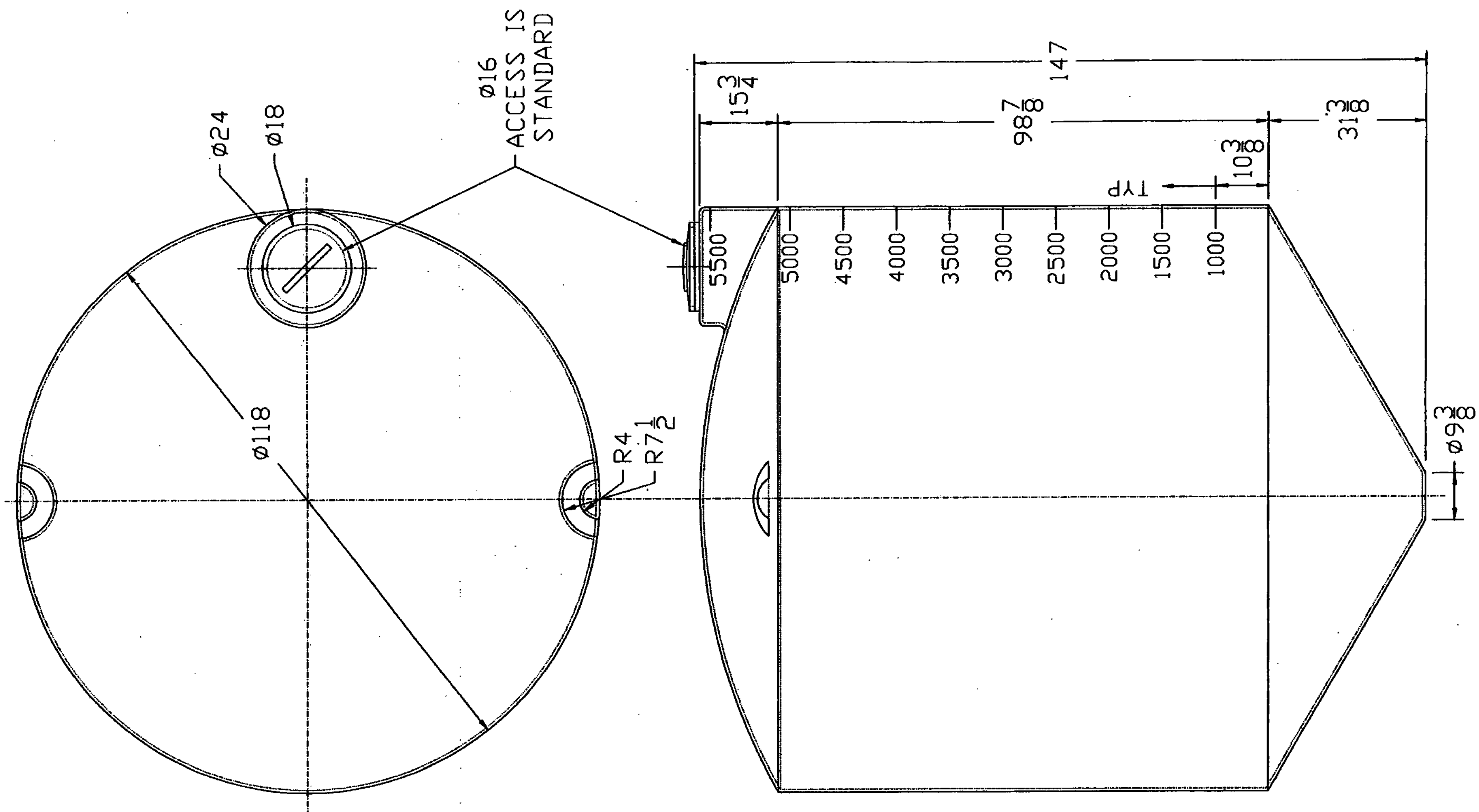
Rev. 1	Date 06/13/00
File Name IA5600-1	Mold Location TN
Date 11/19/99	Drawn By: IIA
Cust. Rep.	

CHEM-TAINER Industries Inc.
361 Neptune Ave. W. Babylon, NY 11704
(631) 661-8300 Fax: (631) 661-8209

TITLE
5600 GAL. VERTICAL BULK STORAGE TANK

Part # TC5600IA/IC

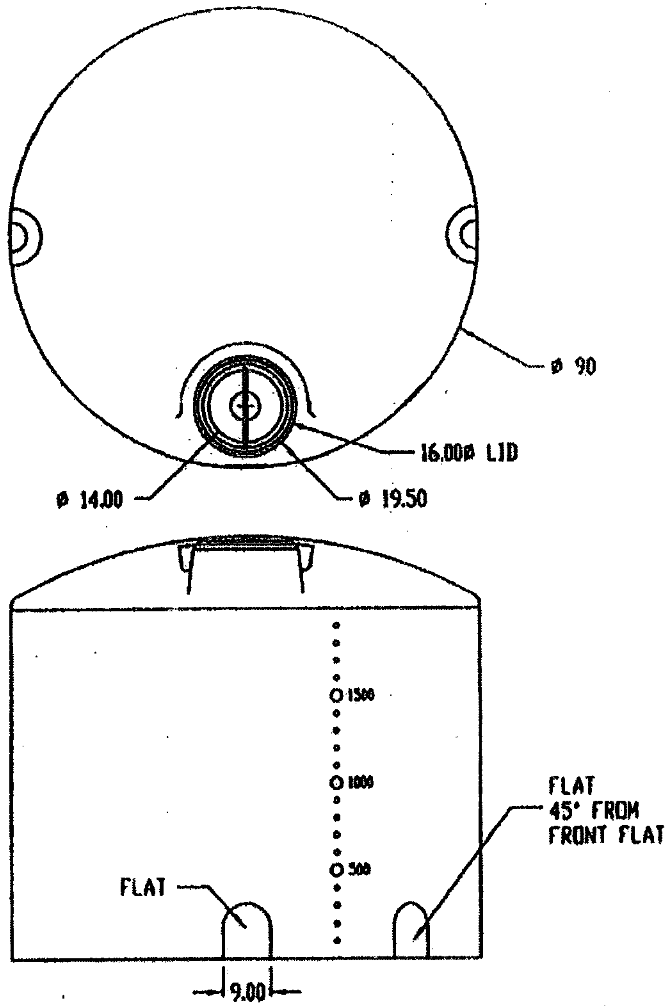
Dwg. # C-5600-1A

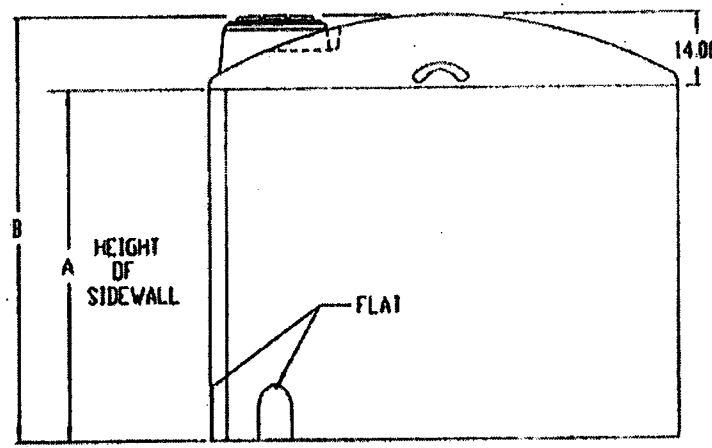


Rev. 1	Date 06/08/00	File Name JA5500-1	
CHEM-TAINER Industries Inc. 361 Neptune Ave. W. Babylon, NY 11704 (631) 661-8300 Fax: (631) 661-8209		Date 12/06/99	Mold Location 00
		Drawn By: IIA	Cust. Rep.
TITLE 5500 GAL. CONE BOTTOM BULK STORAGE TANK			
Part # TN5500JA/JC		Dwg. # C-5500-1N	

ALL DIMENSIONS SHOWN ARE OUTSIDE PART DIMENSIONS IN INCHES,
AND VARY BY THE STANDARD ROTATIONAL MOLDING TOLERANCE OF ±2%.

TANK SIZE	DIMENSION A	DIMENSION B
2000 GAL.	67.00	81.00
2500 GAL.	86.00	100.00
3000 GAL.	104.00	118.00





NOTE: 2000 GALLON TANK SHOWN

ALL DIMENSIONS SHOWN ARE OUTSIDE PART DIMENSIONS IN INCHES, AND VARY BY THE STANDARD ROTATIONAL MOLDING TOLERANCE OF ±2%

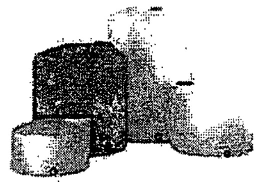
CHEM-TAINER
INDUSTRIES INC.
361 NEPTUNE AVE. W. BABYLON N.Y. 11704
(631) 661-8300 FAX: (631) 661 8209

TITLE: 3000 GALLON VERTICAL TANK

REV.	DATE
DATE 05/02/2005	MOLD LOCATION
DRAWN BY: A.R.	CUST. REP.
APPROVED:	
PART # TA3000IC/IA	

Search Our Site ▶ SEARCH

Plastic Storage Tank



Part Number:	6329VERT
Capacity:	300 Gallon Vertical Poly Storage Tank
Size:	34" dia. x 82" H
USD Price:	345.00
USD Shipping:	CALL FOR PRICING

Contact Us .

Add To Cart

Plastic Storage Tanks

8" manway

2" female threaded outlet

85 lbs.

Greensand Filtration

Chemical Use

Sludge Generation

Calculated by: G. Chen Date: 8/11/2009
Checked by: CJ Date: 9/3/2009

1 Sizing the greensand unit

Assumptions:

Service flow rate q:	5 - 8	gpm/sq. ft.
Backwash flow rate	12 - 14	gpm/sq. ft.

three greensand filters run parallel
influent iron concentration is 3.6 mg/L and each filter will be backwashed every 24 hours

Backwash frequency, h	Flow rate per filter, gpm	filter bed cross section, sq. ft	Diameter of filter bed, ft	Service flow rate, gpm/sq. ft.	
24	66.7	15.90	4.5	4.2	a
24	100	15.90	4.5	6.3	b
24	83	15.90	4.5	5.2	c
24	125	15.90	4.5	7.9	d
24	191	15.90	4.5	12.0	e
24	223	15.90	4.5	14.0	f

a. check service filtration rate with three filters when pumping 200 gpm
b. check service filtration rate with two filters when pumping 200 gpm
c. check service filtration rate with three filters when pumping at 250 gpm
d. check service filtration rate with two filters dwhen pumping 250 gpm
e. check backwash flow rate at 12 gpm/sq. ft.
f. check backwash flow rate at 14 gpm/sq. ft.

2 Total volume of backwashed water

Backwash flow rate:	Qbw =	191	gpm
Backwash time	t =	10	min
Total volume of backwash water	V =	1,910	gallons

Backwash flow rate:	Qbw =	223	gpm
Backwash time	t =	10	min
Total volume of backwash water	V =	2,230	gallons

3 Filter to waste rinse

rinse flow rate (by vendor)	Qbw =	45	gpm
rinse time	t =	3	min
Total volume of rinse water	V =	135	gallons

Regular volume of discharged waste from each backwash cycle	2,045	gallons
Maximum volume of discharged waste from each backwash cycle	2,365	gallons

Calculated by: G. Chen Date: 8/12/2009
Checked by: CJ Date: 9/3/2009

1 Estimated Sodium Hypochlorite Usage

Chlorine (Cl_2) Demand= 0.62 x mg/L Fe + 1.3 x mg/L Mn
Molecular weight of sodium hypochlorite = 74.5 g/mole
Molecular weight of chlorine = 71 g/mole

Fe, mg/L	Mn, mg/L	Chlorine, mg/gal	Equivalent sodium hypochlorite, mg/gal
3.6	0.2	9.4	9.9

Usage
Assuming using 12.5% solution

Flow rate, gpm	Usage, lbs per day	Specific gravity of solution	Usage, gallons per day	**Usage, gallons per month**
200	6.3	1.2	5.0	**150.6**
250	7.8	1.2	6.3	**188.3**

2 Estimated NaOH Usage
Assumption:
assuming 20 ppm NaOH in the groundwater to raise pH above 7, based on other CDM projects
commercial available NaOH at 50% concentration

Flow rate, gpm	Dose of NaOH, mg/L	Daily usage, lbs/day	Equivalent of 50% solution lbs/day	Density of 50% solution, lbs/gal	Equivalent volume, gal/day	**50% solution per month, gal**
200	20	48.0	96.04	12.76	7.5	**225.8**
250	20	60.0	120.05	12.76	9.4	**282.3**

3 Estimated Ferric Chloride Usage
Assumption:
assume ferric chloride dose of 40 mg/L, based on *Wastewater Engineering - Treatment and Reuse* by Metcalf & Eddy.

Backwash waste volume, gallon per wash	Dose of $FeCl_3$, mg/L	Daily usage (3 backwashes), lbs/day	Equivalent of 40% solution lbs/day	Density of 40% solution, lbs/gal	Equivalent volume, gal/day	**40% solution per month, gal**
2045	40	2.0	5.11	12.18	0.4	**12.6**

Calculated by: G. Chen Date: 8/11/2009
Checked by: CJ Date: 9/3/2009

Estimate the sludge generation from the iron removal

1. Assume iron precipitate as ferric hydroxide
   Molecular weight of Fe = 55.85 g/mol
   Molecular weight of $Fe(OH)_3 \cdot 3H_2O$ = 161 g/mol

Influent Fe Concentation, mg/L	Influent Flow Rate, gpm	Ferric hydroxide, lbs/hr	Ferric hydroxide, lbs/day	Solid, lbs/month	1% solid, gal/day
3.6	200	1.04	24.9	748	299
3.6	250	1.30	31.1	934	373

2. Assume using three 4.5-foot diameter greensand filters

Greensand Operation between backwash, hours	Total solid in backwash water per filter, lbs	Total volume of backwash water, gal	Sludge Concentration, lbs/gal	TSS, mg/L	Influent Flow Rate, gpm	1% solid volume, gallon
24	8.31	2000	0.0042	498	200	99.6
24	10.38	2000	0.0052	623	250	124.5

3. Suggesting to pump 150 gallon of sludge from sludge settling tank to sludge holding tank for each backwash cycle.

Appendix E

Appendix E

Permits

PERMIT PROFILE: LONG ISLAND WELLS

TECHNICAL PROGRAM: Division of Water

STATUTORY AUTHORITY: Article 15, Title 15 of the Environmental Conservation Law

APPLICABLE REGULATIONS: 6NYCRR Part 602

LEGISLATIVE INTENT:
To conserve and control the water resources in the Counties of Kings, Queens, Nassau and Suffolk by regulating the installation and operation of certain wells.

REGULATED ACTIVITIES:
- The installation or operation of any well in the County of Kings, Queens, Nassau or Suffolk to withdraw water for any purpose, when the total capacity of such well or wells on any one property is in excess of 45 gallons per minute.

EXEMPT ACTIVITIES:
- The installation of a fire well to which no pumping equipment is permanently attached when such well is installed by a municipal corporation, fire district or duly organized fire company or department.

MINOR PROJECTS:
- A well used solely for cooling purposes where all water pumped will be discharged within 50 vertical feet of the taking and no SPDES permit is required.
- Temporary dewatering systems withdrawing less than one million gallons per day.
- Permanent dewatering systems providing all water pumped is completely discharged within 50 vertical feet of the taking point and no SPDES permit is required.
- A well with a permanently installed pump to be used for fire protection purposes only.
- Acquisition and use, in an existing approved system of a supplemental supply from another approved system having a demonstrated surplus supply.
- Replacement of a well with an equivalent well in the same aquifer having a capacity not more than 110 percent of the original.

PROGRAM SPECIFIC COMPLETENESS REQUIREMENTS:
- Location map of property, wells, diffusion pits, and other pertinent information.
- Construction plans.
- Project data.
- Supplemental Data Forms dependent on the purpose of the well (i.e., irrigation, tank replacement).

PUBLIC NOTICE REQUIREMENTS:
- Environmental Notice Bulletin and newspaper publication for major projects.

STANDARDS FOR ISSUANCE:
- Withdrawal is within safe yield capacity of the aquifer and is consistent with regional water management plans.
- Proper consideration of other sources of supply is undertaken.
- An adequate volume and quality of water is recharged back to an aquifer.
- Works are properly and safely constructed.
- Project is just and equitable with regard to present and future needs for sources of water supply.
- The watershed is adequately protected.
- Where water is used by a water purveyor, the statutory requirements for public water supply must also be satisfied.

REFERENCE MATERIALS/SOURCES OF INFORMATION:
- Division of Water Technical and Operational Guidance Series 3.2.2.

SPECIAL PROCEDURES AND EXCEPTIONS:
- Well drillers in Long Island counties must obtain certificates of registration.
- Permits may be issued for a maximum time period of 10 years, after which permits may be renewed.
- Aquifers are categorized as unstressed, transitional or over-stressed.
- Water purveyors must also obtain a Public Water Supply permit.

October, 1998

PERMIT PROFILE: AIR POLLUTION CONTROL

TECHNICAL PROGRAM: Division of Air Resources

STATUTORY AUTHORITY: Article 19 of the Environmental Conservation Law

APPLICABLE REGULATIONS: 6NYCRR Parts 200 through 317

LEGISLATIVE INTENT:
To maintain a reasonable degree of purity of the air resources of the state consistent with: public health, welfare, and enjoyment; industrial development; propagation and protection of flora and fauna; and protection of physical property and other resources; and to require the use of all available practical and reasonable methods to prevent and control air pollution.

REGULATED ACTIVITIES:
- Owners and/or operators of air contamination sources are required to obtain a Title V Facility Permit, State Facility Permit, or Registration certificate for source construction and operation. Authorizations are for all sources at a facility, not for individual emission points. Registrations are ministerial actions, not subject to UPA.

EXEMPT AND TRIVIAL ACTIVITIES:
- Exempt and trivial activities are listed in Subpart 201-3. These activities are exempt from the Registration provisions of 201-4, and the State Facility permitting provisions of 201-5, but not from other Parts. Exempt activities must be listed in Title V Facility permit applications subject to 201-6, and are exempt unless they are subject to an applicable requirement. The owner and/or operator of an exempt or trivial source may be required to certify that it is properly operated, and must maintain on-site records.

MAJOR PROJECTS:
- Except for minor modifications and administrative amendments to Title V Facility Permits, all federally delegated permits are UPA major projects. In accordance with Paragraph 621.4(g)(2), the following types of projects are major:
  - projects involving the construction of any new "major stationary source" of air pollutants as defined under Part 201; these are:

TITLE V - MAJOR STATIONARY SOURCES

Classification of Area	Affected Area (by Region)	Contaminant	Quantity (TPY)
Attainment	Areas not specifically listed in any of the areas classified as nonattainment.	Regulated Air Pollutants	100
Marginal Nonattainment NO_x & VOC	Region 4: Albany, Greene, Montgomery, Rensselaer, Schenectady Region 5: Saratoga, Essex County-Whiteface Mtn. area above 4500' Region 6: Jefferson Region 9: Erie, Niagara	NO_x	100
		VOC	50
Moderate Nonattainment NO_x, VOC, CO & PM-10	Region 3: Dutchess, Orange County Area except for LOCMA, Putnam [LOCMA = Lower Orange County Metropolitan Area (Towns of Blooming Grove, Chester, Highlands, Monroe, Tuxedo, Warwick and Woodbury)]	NO_x	100
		VOC	50
	Region 1: Nassau Region 2: New York City Region 3: Westchester	CO	50
	Region 2: Manhattan	PM-10	100
Severe Nonattainment NO_x & VOC	Region 1: Nassau, Suffolk Region 2: New York City Region 3: LOCMA, Rockland, Westchester	NO_x	25
		VOC	25
Ozone Transport Region	All of New York State	NO_x	100
	All of New York State	VOC	50

(Cont.)

- projects subject to major new source preconstruction permitting under Part 231 (Nonattainment Areas) or the federal Prevention of Significant Deterioration (PSD) regulations under 40CFR 52.21 (Attainment Areas),
- projects subject to Title V Facility Permit requirements under Part 201 including: initial permitting of subject facilities, significant permit modifications and permit renewals,
- projects requiring the use of federally enforceable emission limitations or caps that will be established in permit conditions and where the proposed project involves:
  - the construction of a new facility, or the construction of new emission sources or modifications at an existing facility, and
  - the limitations are intended to restrict the annual potential to emit of the facility to avoid major stationary source classification described under (a) above, or one or more emission units in order to avoid more stringent emission controls required for projects described under (b) above, that would otherwise apply,
- projects involving emission sources subject to National Emission Standards for Hazardous Air Pollutants (NESHAPS) under 40CFR 61, except for emission sources subject to 40CFR Part 61 Subpart M - National Emission Standards for Hazardous Air Pollutants (HAPS) for Asbestos, Section 61.146, Standards for Demolition and Renovation (see Table 3 in Part 200),
- projects involving the construction of new facilities with emission sources subject to National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 63 (See Table 4 in Part 200),
- projects involving the construction of new highways or roads, or modification of any existing section of highway or road, which require an indirect source permit under 6NYCRR Part 203.

PROGRAM SPECIFIC COMPLETENESS REQUIREMENTS:
- For application content, refer to Section 201-5.2 for State Facility permits, and Subdivision 201-6.3(d) for Title V Facility permits, as well as the New York State Air Permit Application Instructions.

PUBLIC NOTICE REQUIREMENTS:
- Environmental Notice Bulletin and newspaper notice required for all UPA major projects (both delegated and non-delegated), and UPA minor projects which are required to have federally enforceable permit conditions (i.e., "caps"). Draft permits are required for delegated permits. Minimum comment period is 30 days.

STANDARDS OF ISSUANCE:
- The operation of the source will not prevent the attainment or maintenance of any applicable ambient air quality standard.
- Consistency with applicable regulations.
- Consistency with the provisions of the State Implementation Plan (SIP).

REFERENCE MATERIALS/SOURCES OF INFORMATION:
- Air Guide Series and Division of Air Resources Program Policies
- Air Permitting Manual by Division of Environmental Permits

SPECIAL PROCEDURES AND EXCEPTIONS:
- Prevention of Significant Deterioration (PSD) - This federal regulation applies to new major facilities and significant emission increases at existing major facilities located in areas that are in attainment with National Ambient Air Quality Standards; requires use of best available control technology (BACT) and sophisticated air quality modeling to control increases of certain air contaminants.
- New Source Review in Nonattainment Areas (Part 231) - Requires Lowest Achievable Emission Rate (LEAR) control technology and offsetting of emissions from new major facilities or significant emission increases at existing major facilities located in areas that exceed National Ambient Air Quality Standards (nonattainment areas).
- Title V Facility Permits - Federally delegated program requires coordination with EPA, which may object to issuance or revoke a permit, and notice to affected states, tribal lands, and the public. Five day letter provision of UPA does not apply to Title V permits unless DEC has satisfied all requirements regarding notice and review of draft permits.
- Applicants may choose to avoid certain state or federal requirements or regulations by proposing limits or a "cap" on a source's potential to emit.

REGULATORY FEES:
- Environmental program regulatory fees (air pollution program fees and operating permit program fees) are billed annually by the Department, based on the nature of the facility, the type of authorization, and the amount of contaminants emitted. See 6NYCRR Part 482.

NEW YORK STATE
REGISTRATION APPLICATION INSTRUCTIONS

Stationary sources subject to the requirements set forth in 6NYCRR Part 201-4 will be required to register with the Department of Environmental Conservation. Instructions for completing the New York State registration application are provided below.

OWNER/FIRM: Enter the name of the owner of the facility for which this application is being prepared. For individual owners, list the full name (last, middle initial, first). For multiple ownership, where no legal business partnership exists provide the name and mailing address, if different, of each individual owner using a backslash (/) to separate data for each owner. For corporations, include division or subsidiary name, if any. Enter the mailing address of the owner. Include the COUNTRY if foreign owned (otherwise leave blank) and the appropriate ZIP/MAIL CODE (zip code + extension may also be entered). Enter the business TAXPAYER ID number (**no personal Social Security # should be listed**).

OWNER/FIRM CONTACT: List the name and telephone number of the owner/firm representative responsible for answering any air permit inquiries regarding this source.

FACILITY: Enter the name and the correct physical location of the facility (e.g. Acme Rd. or Building 3, XYZ Industrial Park). Check the appropriate box and enter the name of the CITY, TOWN, or VILLAGE, and ZIP CODE for the primary jurisdiction of the facility. For instances where a facility is located in multiple jurisdictions (i.e., across city, town, village or county lines) list all jurisdictions using a backslash (/) to separate data for each location, with the primary jurisdiction listed first.

FACILITY INFORMATION

TOTAL NUMBER OF EMISSION POINTS: Enter the total number of emission points located at this facility. Do not include any emission points which vent emissions exclusively from exempt or trivial activities as defined in 6NYCRR Part 201-3.

CAP BY RULE: Check this box if the potential to emit for the facility is to be capped by rule pursuant to 6NYCRR Part 201-7.3.

DESCRIPTION: Provide an overview description of the facility referred to in this application in terms of its primary function and/or business activity, principal industrial or manufacturing processes including the primary item(s) being manufactured (if applicable), and any other information supporting the SIC codes that are listed below. Mention any specific regulations (i.e., NSPS or New Source Performance Standards, MACT rules) that apply to the facility and provide the rule citation to the subpart level (i.e., Subpart Dc - small boiler NSPS).

STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODES: Enter all SIC codes that apply to the facility with the principle SIC code listed first.

HAP CAS NUMBERS: Specify the Chemical Abstract Series or CAS numbers for any HAP's emitted from the facility (up to a maximum of 12) in order of emission quantity. HAP's refer to hazardous air pollutants as defined in 6NYCRR Part 200. 1(af).

APPLICABLE FEDERAL and NEW YORK STATE REQUIREMENTS (Part No's): List the rule citations of all applicable federal and New York state regulations as they pertain to this facility. The rule citation should be listed to the "Part" level (i.e., Part 201, 212, 60 (for federal NSPS rules)) only. If a regulation is further identified by a subpart citation, the subpart citation and rule title should be listed in the facility description.

CERTIFICATION: Enter the name, official title, signature and date of signature of the responsible official accountable for the compliance of this facility with the applicable regulations. Certification is required by a representative of the firm or applicant responsible for demonstrating the truth, accuracy and completeness of the information contained in this application. The responsible official should be aware that significant penalties could result in submitting false information, including the possibility of fines and imprisonment for knowing violations.

New York State Department of Environmental Conservation
Air Facility Registration

DEC ID
- -

Owner/Firm			Taxpayer ID
Name			
Street Address			
City / Town / Village	State or Province	Country	Zip

Owner/Firm Contact	
Name	Phone No. ( )

Facility	
Name	
Location Address	
☐ City / ☐ Town / ☐ Village	Zip

Facility Information	
Total Number of Emission Points: ______________	☐ Cap by Rule

Description

Standard Industrial Classification Codes					

HAP CAS Numbers					
- -	- -	- -	- -	- -	- -
- -	- -	- -	- -	- -	- -

Applicable Federal and New York State Requirements (Part Nos.)					

Certification	
I certify that this facility will be operated in conformance with all provisions of existing regulations.	
Responsible Official	Title
Signature	Date / /

7/29/96

New York State Department of Environmental Conservation
Division of Water
Bureau of Water Permits, 4th Floor
625 Broadway, Albany, New York 12233-3505
Phone: (518) 402-8111 • **FAX:** (518) 402-9029
Website: www.dec.state.ny.us

Alexander B. Grannis
Commissioner

SPDES PERMIT EQUIVALENT APPLICATION REQUIREMENTS

REMEDIATION DISCHARGES TO SURFACE OR GROUNDWATERS

To request effluent criteria for direct discharges of remediation wastewaters, please provide the following:

1. Discharge rate (i.e. treatment system design capacity);

2. A brief description/flow diagram for the proposed treatment system;

3. A description of the receiving stream, including an accurate USGS map showing the stream and discharge location. When available, provide latitude and longitude of discharge point;

4. Available wastewater monitoring data in the attached tabular format, prepared using the attached tables 6- 10;

5. The proposed first day of discharge (for pump test discharges please do not encourage pump tests during summer low flow periods);

6. Proposed duration of discharge;

7. State whether it is a potentially responsible party, federal superfund or state superfund site, or if the site is a Brownfields site;

8. The name and telephone number of the responsible DER project manager to contact if we have questions or want to borrow a copy of the RI report;

9. The DER Site number (i.e., 1-01-001);

11. The DER contact/address where compliance monitoring data is to be sent;

12. For discharges that will have iron in excess of 0.3 mg/l:
    a. provide monitoring data for iron from both filtered and unfiltered samples.
    b. If the discharge is to groundwater please provide monitoring data for iron from both filtered and unfiltered samples from monitoring wells not influenced by site contamination.
    c. If the discharge is to a relatively small stream compared to the discharge, please provide monitoring data for iron from both filtered and unfiltered samples from and upstream point of the receiving water.

Please note that it is not unusual for a DOW review to take 8 weeks. Please inform responsible parties to plan on submitting requests for effluent criteria at least 8 weeks in advance of the proposed first day of discharge. If you have any questions or comments, please do not hesitate to call one of the following BWP section chiefs:

Al Fuchs 402-8238 (regions 1-3), Shayne Mitchell 402-8125 (regions 4-6), or Brian Baker 402-8124(regions 7-9).

TABLE 6

PRIORITY POLLUTANTS (From: 40CFR Part 122, Appendix D)

Include monitoring results for any of the pollutants listed below that are believed present in the discharge from any outfall at your facility.

GC/MS Volatile fraction compounds:

CAS #	Pollutant Name
00107-02-8	Acrolein
00107-13-1	Acrylonitrile[1]
00071-43-2	Benzene
00075-25-2	Bromoform
00056-23-5	Carbon Tetrachloride
00108-90-7	Chlorobenzene
00124-48-1	Chlorodibromomethane
00075-00-3	Chloroethane
00110-75-8	2-Chloroethylvinyl ether
00067-66-3	Chloroform
00075-27-4	Dichlorobromomethane
00075-34-3	1,1-Dichloroethane
00107-06-2	1,2-Dichloroethane
00075-35-4	1,1-Dichloroethylene
00078-87-5	1,2-Dichloropropane
00542-75-6	1,3-Dichloropropylene
00100-41-4	Ethylbenzene
00074-83-9	Methyl Bromide[1]
00074-87-3	Methyl Chloride
00075-09-2	Methylene Chloride
00079-34-5	1,1,2,2-Tetrachloroethane
00127-18-4	Tetrachloroethylene
00108-88-3	Toluene
00156-60-5	1,2-trans-Dichloroethylene
00071-55-6	1,1,1-Trichloroethane
00079-00-5	1,1,2-Trichloroethane
00079-01-6	Trichloroethene
00075-01-4	Vinyl Chloride

GC/MS Acid Fraction Compounds:

CAS #	Pollutant Name
00095-57-8	2-Chlorophenol
00120-83-2	2,4-Dichlorophenol
00105-69-7	2,4-Dimethylphenol[1]
00534-52-1	4,6-Dinitro-o-cresol
00051-28-5	2,4-Dinitrophenol
00088-75-5	2-Nitrophenol
00100-02-7	4-Nitrophenol
00059-50-7	p-Chloro-m-cresol[1]
00087-86-5	Pentachlorophenol
00108-95-2	Phenol
00088-06-2	2,4,6-Trichlorophenol

GC/MS Base/Neutral fraction compounds

CAS #	Pollutant Name
00083-32-9	Acenaphthene
00208-96-8	Acenaphthylene
00120-12-7	Anthracene
00092-87-5	Benzidine
00056-55-3	Benz(a)anthracene[1]
00050-32-8	Benzo(a)pyrene
00205-99-4	3,4-Benzofluoranthene[1]
00191-24-2	Benzo(ghi)perylene
00207-08-9	Benzo(k)fluoranthene
00111-91-1	Bis(2-chloroethoxy)methane
00111-44-4	Bis(2-chloroethyl)ether
00102-60-1	Bis(2-chloroisopropyl)ether
00117-81-7	Bis(2-ethylhexyl)phthalate
00101-55-3	4-Bromophenyl phenyl ether[1]
00085-68-7	Butylbenzyl phthalate
00091-58-7	2-Chloronaphthalene
07005-72-3	4-Chlorophenyl phenyl ether[1]
00218-01-9	Chrysene
00053-70-3	Dibenz(a,h)anthracene[1]
00095-50-1	1,2-Dichlorobenzene
00541-73-1	1,3-Dichlorobenzene
00106-46-7	1,4-Dichlorobenzene
00091-94-1	3,3'-Dichlorobenzidine
00084-66-2	Diethyl phthalate
00131-11-3	Dimethyl phthalate
00084-74-2	Di-n-butyl phthalate
00606-20-2	2,6-Dinitrotoluene
00117-84-0	Di-n-octyl phthalate
00122-66-7	1,2-Diphenylhydrazine
00206-44-0	Fluroranthene
00086-73-7	Fluorene
00118-74-1	Hexachlorobenzene[1]
00087-68-3	Hexachlorobutadiene[1]
00077-47-4	Hexachlorocyclopentadiene
00067-72-1	Hexachloroethane
00193-39-5	Indeno(1,2,3-cd)pyrene[1]
00078-59-1	Isophorone
00091-20-3	Naphthalene
00098-95-3	Nitrobenzene
00062-75-9	N-nitrosodimethylamine
00621-64-7	N-nitrosodi-n-propylamine
00086-30-6	N-nitrosodiphenylamine
00085-01-8	Phenanthrene
00129-00-0	Pyrene
00120-82-1	1,2,4-Trichlorobenzene[1]

GC/MS Pesticides fraction compounds:

CAS #	Pollutant Name
00309-00-2	Aldrin
00319-84-6	alpha-BHC[1]
00319-85-7	beta-BHC
00058-89-9	gamma-BHC (Lindane)[1]
00319-86-8	delta-BHC[1]
00057-74-9	Chlordane
00050-29-3	4,4'-DDT[1]
00072-55-9	4,4'-DDE[1]
00072-54-8	4,4'-DDD
00060-57-1	Dieldrin
00959-98-8	alpha-Endosulfan[1]
33213-65-9	beta-Endosulfan
01031-07-8	Endosulfan sulfate
00072-20-8	Endrin
07421-93-4	Endrin aldehyde
00076-44-8	Heptachlor
01024-57-3	Heptachlor epoxide[1]
53469-21-9	PCB-1242[1]
11097-69-1	PCB-1254[1]
11104-28-2	PCB-1221[1]
11141-16-5	PCB-1232[1]
12672-29-6	PCB-1248[1]
11096-82-5	PCB-1260[1]
12674-11-2	PCB-1016
08001-35-2	Toxaphene[1]

Dioxin:

CAS #	Pollutant Name
01764-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin[1,2]

Metals and Other Toxic Pollutants:

CAS #	Pollutant Name
07440-36-0	Antimony, Total
07440-38-2	Arsenic, Total
07440-41-7	Beryllium, Total
07440-43-9	Cadmium Total
07440-47-3	Chromium, Total
07440-50-8	Copper, Total
07439-92-1	Lead, Total
07439-97-6	Mercury, Total[1]
07440-02-0	Nickel, Total
07782-49-2	Selenium, Total
07440-22-4	Silver, Total
07440-28-0	Thallium, Total[1]
07440-66-6	Zinc, Total
00057-12-5	Cyanide, Total
	Phenols, Total[3]
01332-21-4	Asbestos

Notes:

1. These pollutants either have FDA fish flesh concentration limits, are identified as Bioaccumulative Chemicals of Concern (BCCs), or are restricted pesticides. .
2. Dioxin is not listed in Part 122, Appendix D, but is a priority pollutant.
3. Phenols, Total is not a Priority Pollutant but is considered a Toxic Substance for permit classification purposes.

TABLE 7

Other Significant Pollutants with NYSDEC Standards/Guidance Values and USEPA/NYSDEC Promulgated Analytical Methods

Include monitoring results for any of the pollutants listed below that are believed present in the discharge from any outfall at your facility.

A. Base/Neutral/Acid Compounds:

CAS Number	Parameter Name
00092-67-1	4-Aminobiphenyl
00062-53-3	Aniline
00140-57-8	Aramite
00106-47-8	4-Chloroaniline
00119-93-7	3,3'-Dimethylbenzidine
00122-09-8	α,α-Dimethylphenethylamine
00099-65-0	1,3-Dinitrobenzene
00122-39-4	Diphenylamine
00070-30-4	Hexachlorophene
01888-71-7	Hexachloropropene
00099-55-8	5-Nitro-o-toluidine
00088-74-4	2-Nitroaniline
00099-09-2	3-Nitroaniline
00100-01-6	4-Nitroaniline
00608-93-5	Pentachlorobenzene[1]
00106-50-3	1,4-Phenylenediamine
00298-02-2	Phorate
00095-94-3	1,2,4,5-Tetrachlorobenzene[1]
00095-53-4	o-Toluidine
00099-35-4	1,3,5-Trinitrobenzene, sym-

B. Conventional Compounds and Metals:

CAS Number	Parameter Name
07664-41-7	Ammonia/ammonium
24959-67-9	Bromide
	Chloride
	Color
	Coliform, Fecal
	Coliform, Total
16984-48-8	Fluoride
	Nitrogen, Nitrate
	Nitrogen, Nitrite
	Methylene Blue Active Substances
07723-14-0	Phosphorus (as P), Total
	Radioactivity
	Alpha, Total
	Beta, Total
	Radium, Total
	Radium 226, Total
	Solids, Settleable
14808-79-8	Sulfate (as SO4)
	Sulfide (as S)
14265-45-3	Sulfite (as SO3)
	Cyanide, Amenable to Chlorination
07440-47-3	Chromium, Hexavalent
07439-90-5	Aluminum, Total
07440-39-3	Barium, Total
07440-42-8	Boron, Total
07440-48-4	Cobalt, Total
07439-89-6	Iron, Total
07439-95-4	Magnesium, Total
07439-98-7	Molybdenum, Total
07439-96-5	Manganese, Total
07440-23-5	Sodium, Total
07440-31-5	Tin, Total
07440-32-6	Titanium, Total
07440-62-2	Vanadium, Total

C. Volatile Organic Compounds:

CAS Number	Parameter Name
00067-64-1	Acetone
00107-05-1	Allyl chloride
00126-99-8	Chloroprene
00074-95-3	Dibromomethane
00110-57-6	trans-1,4-Dichloro-2-butene
00075-71-8	Dichlorodifluoromethane
00156-59-2	cis-1,2-Dichloroethylene
10061-01-5	cis-1,3-Dichloropropene
10061-02-6	trans-1,3-Dichloropropene
00106-93-4	Ethylene dibromide (EDB)
00107-21-1	Ethylene glycol
00591-78-6	2-Hexanone
00126-98-7	Methacrylonitrile
00078-93-3	Methyl ethyl ketone
00074-88-4	Methyl iodide (Iodomethane)
00080-62-6	Methyl methacrylate
00076-01-7	Pentachloroethane
00110-86-1	Pyridine
00100-42-5	Styrene
00630-20-6	1,1,1,2-Tetrachloroethane
00075-69-4	Trichlorofluoromethane
00096-18-4	1,2,3-Trichloropropane
00095-47-6	Xylene, Ortho- (1,2-)
00108-38-3	Xylene, Meta- (1,3-)
00106-42-3	Xylene, Para- (1,4-)

D. Pesticides:

CAS Number	Parameter Name
15972-60-8	Alachlor
00116-06-3	Aldicarb
00834-12-8	Ametryn
02032-59-9	Aminocarb (Metacil)
01610-17-9	Atraton
01912-24-9	Atrazine
00086-50-0	Azinphosmethyl
00101-27-9	Barban
01861-40-1	Benefin
00314-40-9	Bromacil
23184-66-9	Butachlor
00133-06-2	Captan
00063-25-2	Carbaryl
01563-66-2	Carbofuran[1]
00075-99-0	Dalapon
00298-03-3	Demeton (-o)[1]
00126-75-0	Demeton (-S)[1]
00333-41-5	Diazinon
00096-12-8	1,2-Dibromo-3-chloropropane
01918-00-9	Dicamba
00094-75-7	2,4-Dichlorophenoxyacetic acid (2,4-D)[1]
00088-85-7	Dinoseb[1]
00298-04-4	Disulfoton
14484-64-1	Ferbam
02164-17-2	Fluometuron
01071-83-6	Glyphosate (Roundup)[1]
00608-73-1	Hexachlorocyclohexanes
51235-04-2	Hexazinone
00465-73-6	Isodrin
33820-53-0	Isopropalin
00143-50-0	Kepone[1]
00121-75-5	Malathion
08018-01-7	Mancozeb
12427-38-2	Maneb
16752-77-5	Methomyl[1]
00072-43-5	Methoxychlor[1]
00298-00-0	Methyl parathion[1]
00094-74-6	2-Methyl-4-chlorophenoxyacetic acid; MCPA
21087-64-9	Metribuzin
02385-85-5	Mirex (Hexachloropentadiene)[1]
00142-59-6	Nabam[1]
23135-22-0	Oxamyl[1]
00056-38-2	Parathion[1]
00082-68-8	Pentachloronitrobenzene
01610-18-0	Prometon
01918-16-7	Propachlor
00139-40-2	Propazine
00122-42-9	Propham[1]
00122-34-9	Simazine[1]
05902-51-2	Terbacil[1]
13071-79-9	Terbufos[1]
00093-76-5	2,4,5-Trichlorophenoxyacetic acid
01582-09-8	Trifluralin
12122-67-7	Zineb
00137-30-4	Ziram

Notes: 1. These pollutants either have FDA fish flesh concentration limits, are identified as Bioaccumulative Chemicals of Concern (BCCs), or are restricted pesticides.

TABLE 8

Other Significant Pollutants with USEPA/NYSDEC Promulgated Analytical Methods

Include monitoring results for any of the pollutants listed below that are believed present in the discharge from any outfall at your facility.

CAS Number	Pollutant Name
	AOP (Ambam oxidation product)
00075-05-8	Acetonitrile
00098-86-2	Acetophenone
17804-35-2	Benomyl
25057-89-0	Bentazon
00100-51-6	Benzyl alcohol
00100-44-7	Benzyl chloride
35400-43-2	Bolstar (Sulprofos)
51026-28-9	Busan 40
00128-03-0	Busan 85
07440-70-2	Calcium, Total
00128-04-1	Carbam S
10605-21-7	Carbendazim
00075-15-0	Carbon disulfide[1]
00786-19-6	Carbophenothion (Trithion)[1]
03734-48-3	Chlordene
00093-65-2	2-(4-Chloro-2-methylphenoxy)propionic acid; MCPP
00510-15-6	Chlorobenzilate
00101-21-3	Chloropropham
05836-10-2	Chloropropylate
02921-88-2	Chlorpyrifos
05598-13-0	Chlorpyrifos methyl
00056-72-4	Coumaphos
21725-46-2	Cyanazine
00094-82-6	2,4-DB
00134-62-3	DEET
02303-16-4	Diallate
00132-64-9	Dibenzofuran
00097-17-6	Dichlofenthion
00099-30-9	Dichloran
00087-65-0	2,6-Dichlorophenol
00062-73-7	Dichlorvos
00115-32-2	Dicofol
00297-97-2	o,o-Diethyl-o-2-pyrazinyl phosphorothioate (Thionazin)
00060-51-5	Dimethoate
00057-97-6	7,12-Dimethylbenz(a)anthracene
00123-91-1	1,4-Dioxane; diethylene dioxide
00078-34-2	Dioxathion
00330-54-1	Diuron
55283-68-6	Ethalfluralin
00563-12-2	Ethion
00097-63-2	Ethyl methacrylate
00062-50-0	Ethyl methane sulfonate
02593-15-9	Etridiazole
00052-85-7	Famphur
68876-78-8	Fecal Streptococci
00115-90-2	Fensulfothion
00055-38-9	Fenthion (Baytex)[1]
00101-42-8	Fenuron
04482-55-7	Fenuron-TCA
00050-00-0	Formaldehyde
07440-57-5	Gold, Total
03389-71-7	Hexachlorobicycloheptadiene
07439-88-5	Iridium, Total
00078-83-1	Isobutyl alcohol
00120-58-1	Isosafrole
00128-03-0	KN Methyl
00330-55-2	Linuron
26544-20-7	MCPA isooctyl ester
00950-10-7	Mephosfolan
00137-42-8	Metham
02032-65-7	Methyl carbamate; methiocarb[1]
00066-27-3	3-Methyl methanesulfonate
00953-17-3	Methyl trithion
00108-10-1	4-Methyl-2-pentanone; Methyl isobutyl ketone
00056-49-5	3-Methylcholanthrene
00091-57-6	2-Methylnaphthalene
00095-48-7	2-Methylphenol; o-Cresol
00108-39-4	3-Methylphenol; m-Cresol
00106-44-5	4-Methylphenol; p-Cresol
07786-34-7	Mevinphos
00315-18-4	Mexacarbate[1]
00150-68-5	Monuron
00140-41-0	Monuron-TCA
10595-95-6	N-Nitrosomethylethylamine
00059-89-2	N-Nitrosomorpholine
00100-75-4	N-Nitrosopiperidine
00930-55-2	N-Nitrosopyrrolidine
00300-76-5	Naled
00134-32-7	1-Naphthylamine
00091-59-8	2-Naphthylamine
00130-15-4	1,4-Napthoquinone
00555-37-3	Neburon
15339-36-3	Niacaide
00056-57-5	4-Nitroquinoline-1-oxide
07440-04-2	Osmium, Total
07440-05-3	Palladium, Total
00072-56-0	Perthane
00062-44-2	Phenacetin
	Phosphorus, Orthophosphate
00109-06-8	Picoline, alpha-
07440-06-4	Platinum, Total
07440-09-7	Potassium, Total
26399-36-0	Profluralin
07287-19-6	Prometryn
23950-58-5	Pronamide
00107-12-0	Propionitrile
00114-26-1	Propoxur
07440-15-5	Rhenium
07440-16-6	Rhodium, Total
00299-84-3	Ronnel
07440-18-8	Ruthenium, Total
00094-59-7	Safrole
26259-45-0	Secbumeton
01982-49-6	Siduron
07631-86-9	Silica, Dissolved
01014-70-6	Simetrin
00961-11-5	Stirofos
08001-50-1	Strobane[1]
01918-18-9	Swep
05915-41-3	Terbuthylazine
00886-50-0	Terbutryn
00058-90-2	2,3,4,6-Tetrachlorophenol
03689-24-5	Tetraethyl dithiopyrophosphate
43121-43-3	Triadimefon
00327-98-0	Trichloronate
00095-95-4	2,4,5-Trichlorophenol
32534-95-5	2,4,5-Trichlorophenoxyacetic acid, isooctyl ester
41814-78-2	Tricyclazole
00126-68-1	o,o,o-Triethylphosphorothioate
00108-05-4	Vinyl acetate
38714-47-5	ZAC (Zinc ammonium carbonates, etc)

Notes: 1. These pollutants either have FDA fish flesh concentration limits, are identified as Bioaccumulative Chemicals of Concern (BCCs), or are restricted pesticides.

TABLE 9

Other Significant Pollutants with NYSDEC Standards/Guidance Values

Identify any of the pollutants listed below that are believed present in the discharge from any outfall at your facility on the Industrial Chemical Survey form. No USEPA/NYSDEC analytical methods have been promulgated for the pollutants in Table 9. Provide analytical results, if available, as directed in Section III Items 2.A.i. and ii. of the instructions or as an attachment to this application.

CAS Number	Pollutant Name
00079-06-1	Acrylamide
00079-10-7	Acrylic acid
01646-88-4	Aldicarb sulfone
01646-87-3	Aldicarb sulfoxide
68391-01-5	Alkyl dimethyl benzyl ammonium chloride
	Alkyl diphenyl oxide sulfonates
00095-84-1	2-Amino-para-cresol
02835-99-6	4-Amino-meta-cresol
02835-95-2	5-Amino-ortho-cresol
	Aminomethylene phosphonic acid salts
26445-05-6	Aminopyridine
00504-29-0	2-Aminopyridines
00462-08-8	3-Aminopyridines
00504-24-5	4-Aminopyridines
00108-44-1	3-Aminotoluene
00106-49-0	4-Aminotoluene
00100-66-3	Anisole
	Aryltriazoles
00103-33-3	Azobenzene
00098-87-3	Benzal chloride
00271-61-4	Benzisothiazole
00098-07-7	Benzoic trichloride
25973-55-1	2-(2-hydroxy-3,5-di-tert-pentylphenyl)Benzotriazole
00092-52-4	1,1'-Biphenyl
00542-88-1	Bis(chloromethyl)ether
	Boric acid, Borates and Metaborates
00108-86-1	Bromobenzene
00074-97-5	Bromochloromethane
31600-69-8	4-(1-methylethoxy)-1-Butanol
15798-64-8	cis-2-Butenal
00123-73-9	trans-2-Butenal
01190-76-7	cis-2-Butenenitrile
00627-26-9	trans-2-Butenenitrile
00112-34-5	Butoxyethoxyethanol
05131-66-8	Butoxypropanol
	Butyl isopropyl phthalate
02008-41-5	Butylate
00104-51-8	n-Butylbenzene
00135-98-8	sec-Butylbenzene
00098-06-6	tert-Butylbenzene
05234-68-4	Carboxin
00133-90-4	Chloramben
00118-75-2	Chloranil
	Chlorinated dibenzofurans
00460-35-5	3-Chloro-1,1,1-trifluoropropane
00095-69-2	4-Chloro-o-toluidine
00095-79-4	5-Chloro-o-toluidine
00095-51-2	2-Chloroaniline
00108-42-9	3-Chloroaniline
00098-56-6	4-Chlorobenzotrifluoride
00109-69-3	1-Chlorobutane
00107-30-2	Chloromethyl methyl ether
00088-73-3	2-Chloronitrobenzene
00121-73-3	3-Chloronitrobenzene
00100-00-5	4-Chloronitrobenzene
01897-45-6	Chlorothalonil
00095-49-8	2-Chlorotoluene
00108-41-8	3-Chlorotoluene
00106-43-4	4-Chlorotoluene
00506-68-3	Cyanogen bromide
00506-77-4	Cyanogen chloride
13560-89-9	Dechlorane Plus
08065-48-3	Demeton (Systox)[1]
00103-23-1	Di(2-ethylhexyl)adipate
10222-01-2	2,2-Dibromo-3-nitrilopropionamide
03252-43-5	Dibromoacetonitrile
00583-53-9	1,2-Dibromobenzene
00108-36-1	1,3-Dibromobenzene
00106-37-6	1,4-Dibromobenzene
00594-18-3	Dibromodichloromethane
01476-11-5	cis-1,4-Dichloro-2-butene
00328-84-7	3,4-Dichlorobenzotrifluoride
00075-71-8	Dichlorodifluoromethane
00075-43-4	Dichlorofluoromethane
00078-99-9	1,1-Dichloropropanes
00142-28-9	1,3-Dichloropropanes
00594-20-7	2,2-Dichloropropanes
00563-58-6	1,1-Dichloropropene
00098-87-3	α,α-Dichlorotoluene
32768-54-0	2,3-Dichlorotoluenes
00095-73-8	2,4-Dichlorotoluenes
19398-61-9	2,5-Dichlorotoluenes
00118-69-4	2,6-Dichlorotoluenes
00095-75-0	3,4-Dichlorotoluenes
25186-47-4	3,5-Dichlorotoluenes
00076-12-0	1,2-Difluoro-1,1,2,2-tetrachloroethane
00100-18-5	1,4-Diisopropyl benzene
00577-55-9	1,2-Diisopropylbenzene
00099-62-7	1,3-Diisopropylbenzene
00121-69-7	N,N-Dimethyl aniline
01861-32-1	Dimethyl tetrachloroterephthalate
00087-59-2	2,3-Dimethylaniline
00095-68-1	2,4-Dimethylaniline
00095-78-3	2,5-Dimethylaniline
00087-62-7	2,6-Dimethylaniline
00095-64-7	3,4-Dimethylaniline
00108-69-0	3,5-Dimethylaniline
01875-92-9	Dimethylbenzylammonium chloride
00538-39-6	4,4'-Dimethylbibenzyl
04957-14-6	4,4'-Dimethyldiphenylmethane
05197-80-8	Dimethylethylbenzylammonium chloride
00068-12-2	Dimethylformamide
25321-14-6	Dinitrotoluene (mixed isomers)
00602-01-7	2,3-Dinitrotoluene
00619-15-8	2,5-Dinitrotoluene
00610-39-9	3,4-Dinitrotoluene
00618-85-9	3,5-Dinitrotoluene
00957-51-7	Diphenamid
00530-50-7	1,1-Diphenylhydrazines
00085-00-7	Diquat dibromide
02439-10-3	Dodecylguanidine acetate
13590-97-1	Dodecylguanidine hydrochloride
00479-18-5	Dyphilline
00145-73-3	Endothall
53494-70-5	Endrin ketone
00107-07-3	Ethylene chlorohydrin
00075-21-8	Ethylene oxide
00096-45-7	Ethylenethiourea
00133-07-3	Folpet
00093-14-1	Guaifenesin
06108-10-7	Hexachlorocyclohexanes (epsilon)
00302-01-2	Hydrazine
07783-06-4	Hydrogen sulfide
00123-31-9	Hydroquinone
02809-21-4	1-Hydroxyethylidene-1,1-diphosphonic acid
29761-21-5	Isodecyl diphenyl phosphate

TABLE 9
Other Significant Pollutants with NYSDEC Standards/Guidance Values (continued)

00098-82-8	Isopropylbenzene
00527-84-4	2-Isopropyltoluene
00535-77-3	3-Isopropyltoluene
00099-87-6	4-Isopropyltoluene
	Isothiazolones, total
	Linear alkylbenzene sulfonates
00149-30-4	Mercaptobenzothiazole
00079-41-4	Methacrylic acid
04013-34-7	[1-Methoxyethyl]benzene
03558-60-9	[2-Methoxyethyl]benzene
	Methylbenz(a)anthracenes
06217-18-6	Methylene bisthiocyanate
00101-14-4	4,4'-Methylene-bis-(2-chloroaniline)
00101-61-1	4,4'-Methylene-bis-(N,N'-dimethyl)aniline
01807-55-2	4,4'-Methylene-bis-(N-methyl)aniline
00126-39-6	2-Methylethyl-1,3-dioxolane
00611-15-4	2-Methylstyrene
00100-80-1	3-Methylstyrene
00622-97-9	4-Methylstyrene
00098-83-9	α-Methylstyrene
00100-61-8	N-Methylaniline
00098-92-0	Niacinamide
04726-14-1	Nitralin
00139-13-9	Nitrilotriacetic acid
00088-72-2	2-Nitrotoluene
00099-08-1	3-Nitrotoluene
00099-99-0	4-Nitrotoluene
04685-14-7	Paraquat
40487-42-1	Pendimethalin
00101-84-8	Phenyl ether
00637-50-3	3-Phenyl-1-propene
00766-90-5	cis-1-Phenyl-1-propene
00873-66-5	trans-1-Phenyl-1-propene
00095-54-5	1,2-Phenylenediamine
00108-45-2	1,3-Phenylenediamine
00100-63-0	Phenylhydrazine
14838-15-4	Phenylpropanolamine
01918-02-1	Picloram
59536-65-1	Polybrominated biphenyls (PBBs)
00709-98-8	Propanil
00103-65-1	n-Propylbenzene
	Quaternary ammonium compounds
07440-24-6	Strontium 90
34014-18-1	Tebuthiuron
00634-66-2	1,2,3,4-Tetrachlorobenzenes[1]
00634-90-2	1,2,3,5-Tetrachlorobenzenes
02136-79-0	Tetrachloroterephthalic acid
05216-25-1	α,α,α,4-Tetrachlorotoluene
00109-99-9	Tetrahydrofuran
00058-55-9	Theophylline
00137-26-8	Thiram
00095-80-7	Toluene-2,4-diamine
00095-70-5	Toluene-2,5-diamine
00823-40-5	Toluene-2,6-diamine
29385-43-1	Tolyltriazole
00615-54-3	1,2,4-Tribromobenzene
00056-35-9	Tributyltin oxide
00634-93-5	2,4,6-Trichloroaniline
00087-61-6	1,2,3-Trichlorobenzenes
00108-70-3	1,3,5-Trichlorobenzenes
00075-69-4	Trichlorofluoromethane
00093-72-1	2,4,5-Trichlorophenoxypropionic acid (Silvex)[1]
00598-77-6	1,1,2-Trichloropropane
13116-57-9	cis-1,2,3-Trichloropropene
13116-58-0	trans-1,2,3-Trichloropropene
07359-72-0	2,3,4-Trichlorotoluene
56961-86-5	2,3,5-Trichlorotoluene
02077-46-5	2,3,6-Trichlorotoluene
06639-30-1	2,4,5-Trichlorotoluene
23749-65-7	2,4,6-Trichlorotoluene
00098-07-7	α,α,α-Trichlorotoluene
00088-66-4	α,α,2-Trichlorotoluene
00094-99-5	α,2,4-Trichlorotoluene
13940-94-8	α,α,4-Trichlorotoluene
02014-83-7	α-2,6-Trichlorotoluene
00102-47-6	α-3,4-Trichlorotoluene
26523-64-8	Trichlorotrifluoroethanes
00354-58-5	1,1,1-Trichloro-2,2,2-trifluoroethane
00076-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane
00108-67-8	Trimethylbenzenes
00526-73-8	1,2,3-Trimethylbenzenes
00095-63-6	1,2,4-Trimethylbenzenes
00108-67-8	1,3,5-Trimethylbenzenes
25551-13-7	Trimethylbenzenes (mixed isomers)
01463-84-6	2,3,6-Trimethylpyridines
00108-75-8	2,4,6-Trimethylpyridines
00602-29-9	2,3,4-Trinitrotoluene
18292-97-2	2,3,6-Trinitrotoluene
00610-25-3	2,4,5-Trinitrotoluene
00118-96-7	2,4,6-Trinitrotoluene
00603-15-6	3,4,5-Trinitrotoluene
00115-86-6	Triphenyl phosphate
10028-17-8	Tritium
	Uranyl Ion

For discharges to groundwater, also include any substances to which the Principal Organic Contaminant (POC) groundwater standard applies. The POC groundwater standard includes the following classes of compounds: (1) Halogenated alkanes (includes those compounds identified by *Freon, Genatron, Halon, CFC-* and *HCFC-* prefixes in their product names); (2) Halogenated ethers; (3) Halobenzenes and substituted halobenzenes; (4) Benzene and alkyl- or nitrogen-substituted benzenes; (5) Substituted unsaturated hydrocarbons (i.e. straight or branched chain unsaturated hydrocarbon containing one of the following: halogen, aldehyde, nitrile, amide); (6) Halogenated non-aromatic cyclic hydrocarbons. See 6NYCRR Section 700.1 for additional information.

Notes: 1. These pollutants either have FDA fish flesh concentration limits, are identified as Bioaccumulative Chemicals of Concern (BCCs), or are restricted pesticides.

TABLE 10

Other Pollutants and Hazardous Substances Required to be Identified in ICS by Applicants if Present at Facility in Significant Levels

Abamectin [Avermectin B1]
Acephate
Acetic Acid
Acetic anhydride
Acetone cyanohydrin
Acetyl bromide
Acetyl chloride
Acid Compounds
Acifluorfen, sodium salt
Adipic acid
Alkalinity, Carbonate, as CaCO3
d-trans-Allethrin
Allyl alcohol
Allylamine
Aluminum oxide (fibrous form)
Aluminum phosphide
Aluminum sulfate
1-Amino-2-methylanthraquinone
2-Aminoanthraquinone
4-Aminoazobenzene
Amitraz
Amitrole
Ammonium acetate
Ammonium benzoate
Ammonium bicarbonate
Ammonium bichromate
Ammonium bifluoride
Ammonium bisulfite
Ammonium carbamate
Ammonium carbonate
Ammonium chloride
Ammonium chromate
Ammonium citrate
Ammonium fluoride
Ammonium fluoroborate
Ammonium hydroxide
Ammonium nitrate (solution)
Ammonium oxalate
Ammonium silicofluoride
Ammonium sulfamate
Ammonium sulfate (solution)
Ammonium sulfide
Ammonium sulfite
Ammonium tartrate
Ammonium thiocyanate
Ammonium thiosulfate
Amyl acetate
Anilazine
ortho-Anisidine hydrochloride
ortho-Anisidine
para-Anisidine
Antimony pentachloride
Antimony potassium tartrate
Antimony tribromide
Antimony trichloride
Antimony trifluoride
Antimony trioxide
Arsenic disulfide
Arsenic pentoxide
Arsenic trichloride
Arsenic trioxide
Arsenic trisulfide
Avitrol [1]
Azodrin
1-(3-Chloroallyl)-3,5,7-triaza-1-Azoniaadamantane chloride
Bandane
Barium cyanide
Bendiocarb
Bentazon
Benzaldehyde
Benzamide
Benzeneacetic acid
1,2-Benzenedicarboxaldehyde
Benzenepropanoic acid
Benzo(e)pyrene
Benzo(j)fluoranthene
Benzo(rst)pentaphene
Benzoic acid
Benzoic acid
Benzoic acid, ammonium salt
Benzonitrile
2-(Thiocyanomethyltrio)Benzothiazole
Benzoyl chloride
Benzoyl peroxide
Beryllium chloride
Beryllium fluoride
Beryllium nitrate
Bidrin
Bifenthrin
Bis(2-chloro-1-methylethyl)ether
1,3-Bis(methylisocyanate)cyclohexane
1,4-Bis(methylisocyanate)cyclohexane
Bis(pentabromophenyl)ether
Bismuth, Total
Bornyl
Boron trichloride
Boron trifluoride
Brodifacoum (Talon) [1]
Bromacil, lithium salt [1]
Bromadialone (Maki)
Bromethalin
Bromine
1-Bromo-1-(bromomethyl)-1,3-propane dicarbonitrile
Bromophos
Bromoxynil
Bromoxynil octanoate
Bronopol
Brucine
1,3-Butadiene
1-Butanol
Butyl acrylate
sec-Butyl alcohol
Butylacetate
Butylamine
N-Butylbenzene sulfonamide
4,4-Butyldenebis-(6-T-butyl-M-cresol)
1,2-Butylene oxide
N-Butylphthalate
Butyraldehyde
Butyric acid
4-(4-Chloro-2-methylphenoxy) Butyric acid
C.I. Acid Green 3
C.I. Acid Red 114
C.I. Basic Green 4
C.I. Basic Red 1
C.I. Direct Black 38
C.I. Direct Blue 218
C.I. Direct Blue 6
C.I. Direct Brown 95
C.I. Disperse Yellow 3
C.I. Food Red 15
C.I. Food Red 5
C.I. Solvent Orange 7
C.I. Solvent Yellow 14
C.I. Solvent Yellow 3
C.I. Solvent Yellow 34 (Auramine)
C.I. Vat Yellow 4
Cacodylic acid
Cadmium acetate
Cadmium bromide
Cadmium chloride
Calcium arsenate
Calcium arsenite
Calcium carbide
Calcium chromate
Calcium cyanamide
Calcium cyanide
Calcium dodecylbenzenesulfonate
Calcium hypochlorite
Caprolactam
Captafol
Carbamates
Carbazole
Carbonyl sulfide
Catechol
Chinomethionat
Chloral
Chlorendic Acid
Chlorfenvinphos (Birlane) [1]
Chlorimuron ethyl
Chlorine
Chlorine dioxide
3-Chloro-2-methyl-1-propene
4-Chloro-3,5-dimethylphenol
Chloroacetic acid
2-Chloroacetophenone
4-Chlorobenzoic acid
Chlorophacinone (Rozol) [1]
para-Chlorophenyl isocyanate
Chloropicrin
3-Chloropropionitrile
Chlorosulfonic acid
Chlorotetrafluoroethane
Chlorothymol
Chlorsulfuron
Cholecalciferol (Quintox) [1]
Chromic acetate
Chromic acid
Chromic sulfate
Chromous chloride
Cimectacarb
Clopyralid
Cobaltous bromide
Cobaltous formate
Cobaltous sulfamate
Creosote
para-Cresidine
Crotonaldehyde
Cupferron
Cupric acetate
Cupric acetoarsenite
Cupric chloride
Cupric nitrate
Cupric oxalate
Cupric sulfate
Cupric sulfate ammoniated
Cupric tartrate
Cyanogen chloride
Cycloate
Cyclohexamide (Actidone) [1]
Cyclohexane
1,4-Cyclohexane diisocyanate
Cyclohexanol
Cyclohexanone
Cyclohexanone oxime
Cyclohexene
Cyclohexylamine
Cyclopentanone
Cyclotrimethylenetrinitramine
Cyfluthrin
Cyhalothrin
2,4-DP
Daminozide (Alar) [1]
Dasanit
Dazomet
Dazomet, sodium salt
Decanal
2,4-Diaminoanisole sulfate
2,4-Diaminoanisole
4,4'-Diaminodiphenyl ether
Diaminotoluene (mixed isomers)
Dibenz(a,h)acridine
Dibenz(a,j)acridine
Dibenzo(a,e)fluoranthene
Dibenzo(a,e)pyrene
Dibenzo(a,h)pyrene
Dibenzo(a,l)pyrene
Dibenzo(c,g)carbazole, 7H-
Dibutyltin chloride
Dibutyltin dilaurate
Dichlobenil
Dichlone
2,3-Dichloro-1,4-napthoquinone (Dichlone)
1,4-Dichloro-2-butene
3,3'-Dichlorobenzidine dihydrochloride
3,3'-Dichlorobenzidine sulfate
1,4-Dichlorobutane
Dichlorophene
2,3-Dichlorophenol
2,4-Dichlorophenoxyacetic acid (2,4-D), 2-ethylhexyl ester
2,4-Dichlorophenoxyacetic acid (2,4-D), propylene glycol butyl ether ester
2,4-Dichlorophenoxyacetic acid (2,4-D), 2-ethyl-4-methylpentyl ester
2,4-Dichlorophenoxyacetic acid (2,4-D), butoxyethyl ester
2,4-Dichlorophenoxyacetic acid (2,4-D), butyl ester
2,4-Dichlorophenoxyacetic acid (2,4-D), chlorooctyl ester
2,4-Dichlorophenoxyacetic acid (2,4-D), isopropyl ester
2,4-Dichlorophenoxyacetic acid (2,4-D), sodium salt
2,4-Dichlorophenoxyacetic acid (2,4-D), isobutyl ester
2,3-Dichloropropene
2,2-Dichloropropionic acid
Dichlorotetrafluoroethane (CFC-114)
α,α-Dichlorotoluene
Diclofop methyl
Dicyclohexylamine
Dicyclopentadiene
Diepoxybutane
Diethanolamine
Diethatyl ethyl
Diethyl formamide
Diethyl maleate
Diethyl mercury
Diethyl sulfate
Diethylamine
Diethylaminoethanol
Diethyldiisocyanatobenzene
Diethylene glycol
Diethylene glycol monoethyl ether
Diethylhexylphthalate isomer
Diethyltin dycaprylate
Diflubenzuron
Diglycidyl resorcinol ether
2,3-Dihydro-1,6-dimethyl-1H-indene
2,3-Dihydro-1-methyl-1H-indene
Dihydrosafrole
4,4'-Diisocyanatodiphenyl ether
2,4'-Diisocyanatodiphenyl sulfide
Diisopropyl ether
Diisopropylamine
Dimethipin
3,3'-Dimethoxybenzidine dihydrochloride,
3,3'-Dimethoxybenzidine hydrochloride,
3,3'-Dimethoxybenzidine,
3,3'-Dimethoxybenzidine-4,4'-diisocyanate
Dimethyl chlorothiophosphate
trans-1,4-Dimethyl cyclohexane
Dimethyl sulfate
2,2-Dimethyl-2,3-Dihydro-7-Benzofuranol
3,3'- Dimethyl-4,4'-diphenylene diisocyanate
Dimethylamine
Dimethylamine dicamba
3,3'- Dimethylbenzidine dihydrochloride (o-Tolidine dihydrochloride)
3,3'-Dimethylbenzidine dihydrofluoride
Dimethylcarbamyl chloride
Dimethyldichlorosilane
Dimethyldioxane
3,3'-Dimethyldiphenylmethane-4,4'-diisocyanate
Dimethyldithiocarbamate
2,5-Dimethylfuran
1,1-Dimethylhydrazine
1,2-Dimethylhydrazine
2,6-Dimethylphenol
Dimethylphenylcarbinol
Dimethylterephthalate
ortho-Dinitrobenzene
para-Dinitrobenzene
Dinitrophenol
Dinocap [1]
Diphacinone
Dipotassium endothall
Dipropyl isocinchomeronate
Diquat
Disodium cyanodithioimidocarbonate
Di-Syston
2,4-Dithiobiuret
Dithiocarbamate
Dodecanoic acid

TABLE 10 (Ctd.)

Other Pollutants and Hazardous Substances Required to be Identified in ICS by Applicants If Present at Facility in Significant Levels

Dodecene-4
Dodecylbenzesulfonic acid
Dyphonate
EDTA
EDTA, Ammoniated
EPN
Epichlorohydrin
Ethoprop
2-Ethoxyethanol
2-Ethoxyethanol acetate
Ethyl acetate
Ethyl acrylate
Ethyl chloroformate
Ethyl di-n-propylthiocarbamate (EPTC)
Ethyl ether
Ethyl mercuric chloride
Ethylene
Ethylene cyanohydrin
Ethylene dichloride
Ethylene glycol dinitrate
Ethylenediamine
Ethyleneimine (Aziridine)
Fenamiphos
Fenarimol
Fenbutatin oxide
Fenoxaprop ethyl
Fenoxycarb
Fenpropathrin
Fenvalerate
Ferric ammonium citrate
Ferric ammonium oxalate
Ferric chloride
Ferric fluoride
Ferric nitrate
Ferric sulfate
Ferricyanide
Ferrocyanide
Ferrous ammonium sulfate
Ferrous sulfate
Ferrous chloride
Fluazifop butyl
Fluoride, Complex
Fluoride, Free
Fluorine
Fluoroborates
Fluorouracil
Fluvalinate
Fomesafen
Formetanate hydrochloride (Carazol SP)[1]
Formic acid
Fumaric acid
Fumarin
Furan
Furazolidone
Furfural
Furium
Glycidaldehyde
Guthion
n-Heptane
1-Heptanol
2-Heptanol
3-Heptanol
4-Heptanol
Hexachloronaphthalene
Hexamethyl benzene
Hexamethylene diamine
Hexamethylene-1,6-diisocyanate
Hexamethylphosphoramide
Hexanate
n-Hexane
3-Hexanone
Hydramethylnon
Hydrazine sulfate
Hydrochloric acid
Hydrofluoric acid
Hydrogen cyanide
Hydrogen fluoride
Hydrogen peroxide
α-Hydroxy-α-methylbenzeneacetic acid
3-Hydroxycarbofuran
1-Hydroxyethylidene
Hydroxyquinoline, total
Imazalil
Iodide (as I)

3-Iodo-2-propynyl butylcarbamate
Iron pentacarbonyl
1,3-Isobenzofurandione
1,(3H)-Isobenzofuranone
Isobutyraldehyde
Isofenphos
Isophorone diisocyanate
Isoprene
Isopropanolamine
dodecylbenzenesulfonate
Isopropyl alcohol
Isopropylamine
Isopropylbenzene hydroperoxide
4,4'-Isopropylidenediphenol
Karbutilate
Kelthane
Lactofen
Lanthanum, Total
Lead acetate
Lead arsenate
Lead chloride
Lead flourite
Lead fluoborate
Lead iodide
Lead nitrate
Lead stearate
Lead sulfate
Lead sulfide
Lead thiocyanate
Lethane 384
Lithium carbonate
Lithium chromate
Lithium, Total
2,5-Lutidine
Magnesium phosphide[1]
Maleic anhydride
Maleic hydrazide
Malononitrile
Mercaptodimethur
Mercuric cyanide
Mercuric nitrate
Mercuric sulfate
Mercuric thiocyanate
Mercurous nitrate
Merphos
Methacrylamide
Methacrylate
Methanol
Methazole
Methoprene1
Methoxone sodium salt
2-Methoxy-5-nitroaniline
2-Methoxyethanol acetate
2-Methoxyethanol
Methoxypropylamine
Methyl acetate
2-Methyl benzene sulfonamide
Methyl chlorocarbonate
Methyl isobutyl ketone
Methyl isocyanate
Methyl isothiocyanate
Methyl mercaptan
Methyl mercury
Methyl tert-butyl ether
2-Methyl-2-propanol
1-Methyl-4-(1-methyethenyl)cyclohexene
Methylamine
2-Methylanthracene
9-Methylanthracene
2-Methylbenzaldehyde
3-Methylbenzaldehyde
4-Methylbenzaldehyde
4-Methylbenzene sulfonamide
4-Methylbenzenemethanol
2-Methylbenzoic acid
3-Methylbenzoic acid
5-Methylchrysene
Methylcyclopentane
4-Methyldiphenylmethane-3,4-
diisocyanate
1,1-Methylene
bis(4-isocyanatocyclohexane)
Methylenebis(phenylisocyanate) (MDI)

4,4'-Methylenedianiline
1-Methylnaphthalene
Methylolmethacrylamide
Methylphthalate
Methyltrichlorosilane
Metiram
Metolachlor
Michler's ketone
Molinate
Molybdenum trioxide
Monitor
Monochlorobenzyl trifluoride
Monoethylamine
Monomethylamine
Mustard gas
(1,1'-thiobis[2-chloro-]Ethane)
Myclobutanil
N-Methyl-2-pyrrolidone
N-Methylolacrylamide
N-Nitroso-N-methyl urea
N-Nitrosodi-N-butylamine
N-Nitrosodiethylamine
N-Nitrosomethylvinylamine
N-Nitrosonornicotine
1,5-Naphthalene diisocyanate
Naphthenic acid
α-Naphthyl thiourea[1]
Nickel ammonium sulfate
Nickel chloride
Nickel hydroxide
Nickel nitrate
Nickel sulfate
Nicotine alkaloid[1]
Nitrapyrin
Nitric acid
4-Nitrobiphenyl
Nitrocyclohexane
Nitrofen
Nitrofurans
Nitrofurantoin
Nitrofurazone
Nitrogen dioxide
Nitrogen mustard
Nitroglycerin
2-Nitropropane
1-Nitropyrene
para-Nitrosodiphenylamine
Nonanal
1-Nonanol
Norflurazon
Octachlorocyclopentene
Octachloronaphthalene
Octachlorostyrene
Octamethylpyrophosphoramine
Oryzalin
Osmium tetroxide
Oxalic acid, benzyl ester
Oxydemeton methyl
Oxydiazon
Oxyfluorfen
Ozone
Paraformaldehyde
Paraldehyde
Paraquat dichloride
Pebulate
Pentac
Pentanate
Pentobarbital sodium
Peracetic acid
Perchloromethyl mercaptan
Permethrin
Phenothrin
1,3-Phenylene diisocyanate
1,4-Phenylene diisocyanate
1,2-Phenylenediamine dihydrochloride
1,4-Phenylenediamine dihydrochloride
Phenylmercuric acetate
2-Phenylphenol
4-Phenylphenol
Phenytoin
Phosdrin
Phosgene[1]
Phosphamidon[1]

Phosphate, Ortho
Phosphate, as PO4
Phosphine
Phosphoric acid
Phosphorus oxychloride
Phosphorus pentasulfide
Phosphorustrichloride
Photomirex
Phthalate Esters
Picric acid
Piperonyl butoxide
Pirimiphos methyl
Pival
Polybutene(1-propene, 2-methyl
homopolymer)
Polymeric diphenylmethane diisocyanate
Polymethacrylic Acid
Potassium N-methyldithiocarbamate
Potassium arsenate
Potassium arsenite
Potassium bichromate
Potassium bromate
Potassium chromate
Potassium cyanide
Potassium hydroxide
Potassium permanganate
Prodiamine
Profenofos
Propane sultone
1-Propanol
Propargite
Propargyl alcohol
1-Propene
Propetamphos
Propiconazole
β-Propiolactone
Propionaldehyde
Propionic acid
Propionic anhydride
Propylene glycol
Propylene glycol monoethyl ether
Propylene glycol monomethyl ether
Propylene oxide
Propyleneimine
Pyrethrins
Quinoline
Quinone
1,4-Quinone dioxide
Quizalofop ethyl
Randox
Reserpine
Resmethrin
Resorcinol
Rhodamine WT
Rotenone
Saccharin (manufacturing)
Schradan
Selenium oxide
Sethoxydim
Sevin
Silver nitrate
Sodium
Sodium Molybdate
Sodium Nitrite
Sodium Sulfate
Sodium adipate, disodium salt
Sodium arsenate
Sodium arsenite
Sodium azide
Sodium bichromate
Sodium bifluoride
Sodium bisulfite
Sodium chromate
Sodium cyanide
Sodium dicamba
Sodium diethyldithiocarbamate
Sodium dodecylbenzenesulfonate
Sodium fluoride
Sodium fluoroacetate[1]
Sodium hydrosulfide
Sodium hydroxide
Sodium hypochlorite

TABLE 10 (Ctd.)

Other Pollutants and Hazardous Substances Required to be Identified in ICS by Applicants if Present at Facility in Significant Levels

Sodium methylate
Sodium nitrite
Sodium o-phenylphenoxide
Sodium pentachlorophenate
Sodium phosphate (tribasic)
Sodium selenite
Sodum phosphate (dibasic)
Strontium chromate
Strychnine
Styrene oxide
Sulfotepp
Sulfur monochloride
Sulfuric acid
Sulfuryl fluoride (Vikane)[1]
Supracide
Tellurium, Total
Temephos
Tetrachlorodiphenyl ethane (TDE)
Tetracycline hydrochloride
Tetraethyl leadTetraethyl pyrophosphate[1]
Tetraethyl tin
Tetramethrin
1,2,4,5-Tetramethylbenzene
Thallium sulfate
2-(4-Thiazolyl)-1H-benzimidazole
Thioacetamide
Thiobencarb

Thiocyanate
4,4'-Thiodianiline
Thiodicarb
Thiofanox
Thiophanate ethyl
Thiophanate methyl
Thiosemicarbazide
Thiourea
Thorium dioxide
Titanium tetrachloride
Toluene diisocyanate
Toluene-2,6-diisocyanate
ortho-Toluidine hydrochloride
Tri-N-butyl phosphate
Triallate
Tribenuron methyl
Tributyltin
Tributyltin fluoride
Tributyltin methacrylate
S,S,S-Tributyltrithiophosphate (DEF)
Trichlorfon
Trichloroacetyl chloride
Trichlorofon
2,4,5-Trichlorophenoxy acetic acid, amines
2,4,5-Trichlorophenoxy acetic acid salts

Trichlorophenoxy propanoic acid (2,4,5-TP), esters
α,α,α-Trichlorotoluene
Triclopyr triethylammonium salt
Triethanolamine dodecylbenzenesulfonate
Triethylamine
Trifoline
Trimethyl phosphate
Trimethylamine
1,3,5-Trimethylbenzene
Trimethylchlorosilane
3,3,5-Trimethylcyclohexanone
2,2,4-Trimethylhexamethylene diisocyanate
2,4,4-Trimethylhexamethylene diisocyanate
2,3,5-Trimethylphenyl methylcarbamate
Triphenyltin chloride
Tris(2,3-dibromopropyl) phosphate
Trypan blue
Uranyl acetate
Uranyl nitiate
Urethane (Ethyl carbamate)
Valone (PMP)
Vanadium pentoxide

Vernolate
Vinclozolin
Vinylidene chloride
Vinyl bromide
Vinyl fluoride
Vanadyl sulfate
Warfarin
Zinc acetate
Zinc ammonium chloride
Zinc borate
Zinc bromide
Zinc carbonate
Zinc chloride
Zinc fluoride
Zinc formate
Zinc hydrosulfite
Zinc nitrate
Zinc phenolsulfonate
Zinc phosphide
Zinc silicofluoride
Zinc sulfate
Zirconium nitrate
Zirconium potassium flouride
Zirconium sulfate
Zirconium tetrachloride
Zinc cyanide
Zinophos

Notes: 1. These pollutants either have FDA fish flesh concentration limits, are identified as Bioaccumulative Chemicals of Concern (BCCs), or are restricted pesticides.

APPLICATION FOR SPDES PERMIT EQUIVALENT REQUIREMENTS

1. Conventional Monitoring Information - Table 1

The following monitoring information must be included.

Parameter	Raw Wastewater or Monitoring Well				Projected or Actual Treated Wastewater (if available)		
	Units	Min	Max	Avg	Min	Max	Avg
Flow							
pH							
BOD5							
TSS							
TDS							
TKN							
Ammonia							

2. Sampling Information - Priority Pollutants, Toxic Pollutants, and Hazardous Substances

i. Do you know or have reason to believe that any of the pollutants listed in Tables 6, 7, or 8 of the instructions are present in the discharge from this outfall?

- ☐ **Yes** - If yes, monitoring data must be included in table 2 (next pg)
- ☐ **No** - Go to Item **ii.** below.

ii. Do you know or have reason to believe that any of the pollutants listed in Table 9 or Table 10 of the instructions, or any other toxic, harmful, or injurious chemical substances not listed in Tables 6-10, are present in the discharge from this outfall?

- ☐ **Yes** - Source or reason for presence in discharge attached
- ☐ **Yes** - Quantitative or qualitative data attached
- ☐ **No**

2. Monitoring Information for Priority Pollutants, Toxic Pollutants, and Hazardous Substances - Table 2

CAS #	Parameter	Raw Wastewater or Monitoring Well				Projected or Actual Treated Wastewater (if available)		
		Units	Min	Max	Avg	Min	Max	Avg

State Pollutant Discharge Elimination System (SPDES)

Application Supplement B
DISCHARGES WITHIN SOLE SOURCE AQUIFERS

Facility Name:	SPDES Number: NY

Your facility may be located in a sole source aquifer area, which is an area designated by Federal or State statutes. Maps showing the designated sole source areas can be found on the internet at: www.epa.gov/Region02/water/aquifer/index.html.

Chapter 663 of the Laws of 1983 added Section 17-0828 to the Environmental Conservation Law which requires that any person seeking a SPDES permit or a renewal hereunder, within an area designated pursuant to any federal or state statute as a sole source aquifer, shall include as a part of the required information, the name and address of all public water purveyors with a service area or portion thereof located within a three mile radius of the applicant's facility.

For purposes of this section "public water purveyor" shall mean any person, partnership, public or private corporation, municipality, or public authority which sells water derived from a sole source aquifer to at least five service connections or at least twenty-five individuals.

1. Water Purveyors within a three mile radius of your facility:

Please complete the following information to the best of your knowledge and attach it to your application. Attach additional copies of this sheet as necessary.

	Name	Address
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		

Appendix F

Appendix F

Access Agreements

CONSENT FOR ACCESS TO PROPERTY

Property Owner: County of Nassau
Properties Address: 1) Section 44, Block 77, Lot 6A, Clinton Road, Garden City, New York
2) Nassau County Recharge Basin #124

The County of Nassau ("County") owns certain properties situated at the above locations ("Properties"). The County understands that the United States Environmental Protection Agency ("EPA") is conducting response activities on the Properties pursuant to its response and enforcement responsibilities under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. §§ 9601-9675.

As a designated representative of the County, by this license, I hereby consent to allow officers, employees, and authorized representatives of EPA to enter, and have continued access to the Properties in order to construct, operate, and maintain a groundwater extraction and treatment system, as shown generally on the attached figure dated August 4, 2009, consisting of the following components, which will be reduced to an easement once construction is completed:

1) a groundwater treatment plant building, 70 feet by 40 feet of which will be located on the Property adjacent to the Garden City Water District Pumping Station property (Lot 1A); A 15-foot buffer area around the building will also be needed. If determined by EPA to be necessary, any scaling down of the size of the treatment plant building will be done proportionally on both the Village Property and the County property.
2) the treatment plant building will be approximately 30 feet in height. EPA will coordinate with the County regarding the exterior façade. A security camera would be installed on the exterior of the building on the Village property;
3) approximately 20 feet of influent piping installed 4 feet below ground on the northernmost part of Lot 6A;
4) approximately 450 feet of influent and approximately 450 feet of effluent piping installed 4 feet below ground beginning at the southwest corner of Lot 6A to treatment plant (within 20 feet of the fence line between Lot 6A and Lot 1A);
5) discharge of treated effluent to Recharge Basin #124 via County stormwater manhole located along Clinton Road; and
6) ingress and egress to the Properties to carry out the above response activities.

The County understands that such representatives may include contractors and/or subcontractors hired by EPA. In addition, the County understands that representatives may be from other federal and state agencies and their agents. The County also consents to entry and access by the above-mentioned representatives upon the Properties at all reasonable times upon prior notification to the County. EPA has informed the County that, through its agents, employees, contractors, consultants, and subcontractors, it will notify the County in advance of access to the property to conduct clean up activities and will conduct the work at reasonable times of the day and in a manner which minimizes interference with the County's activities at the Properties.

The County recognizes that performance of such actions may require some disturbance to the Properties and EPA will minimize any disturbance as much as possible. Areas of disturbance will be restored to a similar condition by EPA. At the end of the remediation period, if requested by the County, EPA will remove any structures, equipment, and improvements on the Properties related to the remediation.

This consent shall have no effect on any claims by the County for compensation for the activities performed by EPA on the Properties.

EPA contractors maintain insurance, including commercial general liability and automobile insurance, insurance, both of which are or will be maintained at all times that EPA and/or its contractors are performing the above responsive activities on the Properties. In addition, EPA's contractor has added the County as an additional insured to the contractor's commercial general liability and automobile insurance.

By my signature, I acknowledge that I am fully authorized to grant such access and that this written permission is given voluntarily with the knowledge of the right to refuse.

Marilyn Gottlieb
Signature

Date: 8/27/09

Marilyn Gottlieb
Printed Name

Chief Deputy County Executive
Title

CONSENT FOR ACCESS TO PROPERTY

Property Owner: Incorporated Village of Garden City
Property Address: Garden City Pumping Station - Section 44, Block 77, Lot 1A, Clinton Road, Garden City, New York

The Incorporated Village of Garden City ("Village") owns certain property situated at the above location ("Property"). The Village understands that the United States Environmental Protection Agency ("EPA") is conducting response activities on the Property pursuant to its response and enforcement responsibilities under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. §§ 9601-9675.

As a designated representative of the Village, by this license, I hereby consent to allow officers, employees, and authorized representatives of EPA to enter, and have continued access to the Property in order to construct, operate, and maintain a groundwater extraction and treatment system, as shown generally on the attached figure dated August 4, 2009, based upon the following specific components, which will be reduced to an easement once construction is completed:

1) a groundwater treatment plant building, 40 feet by 40 feet of which will be located on the Property to the west of the County property (Lot 6A) notch, and set back from the line of pine trees along the northern boundary of the Property (Lot 1A) so as to preserve those trees, but requiring the removal of two locust trees located along the fence line between the Property and Lot 6A. A 15-foot buffer area around the building will also be needed, but the integrity of the trees in the buffer area will be maintained. If determined by EPA to be necessary, any scaling down of the size of the treatment plant building will be done proportionally on both the Village Property and the County property.
2) the treatment plant building not to exceed 35 feet in height. EPA has been shown examples of façades by the Village which EPA believes it can accommodate. EPA will coordinate with the Village, including its Architectural Review Board, regarding the exterior facade. A security camera would be installed on the exterior of the building to monitor access to the Site from Clinton Road;
3) as shown on the attached figure dated August 4, 2009, approximately 1,000 feet of influent piping installed 4 feet below ground, along Hazelhurst Park and at the Property;
4) as shown on the attached figure dated August 4, 2009, approximately 200 feet of effluent piping installed 4 feet below ground running along Clinton Road;
5) as shown on the attached figure dated August 4, 2009, a gravel area approximately 30 feet by 50 feet in front of the treatment plant to be used for vehicular access to the treatment building;
6) during the construction phase of the project, establishment of a temporary staging area approximately 170 feet by 50 feet located on the Property adjacent to the new access road, as shown on the attached figure dated August 4, 2009, which would include placement of a trailer, staging of equipment, supplies, and support trucks, and the temporary storage of building materials, water tanks, roll-off containers and drums;
7) an access road approximately 250 feet long and 12 feet wide, that would begin at the existing driveway to the Property from Clinton Road and end at the treatment plant building;
8) if requested by the Village, installation of fencing to restrict access to the access road, which would be placed approximately 1.5 feet from each side of the access road; and
9) ingress and egress to the Property to carry out the above response activities.

The Village understands that such representatives may include contractors and/or subcontractors hired by EPA. In addition, the Village understands that representatives may be from other federal and state agencies and their agents. The Village also consents to entry and access by the above-mentioned representatives upon the Property at all reasonable times upon prior notification to the Village. EPA has informed the Village that, through its agents, employees, contractors, consultants, and subcontractors, it will notify the Village in advance of access to the property to conduct clean up activities and will conduct the work at reasonable times of the day and in a manner which minimizes interference with the Village's activities at the Property.

The Village recognizes that performance of such actions may require some disturbance to the Property and EPA will minimize any disturbance as much as possible. Areas of disturbance will be restored to its prior similar condition by EPA. Within twenty-four months of the end of the remediation period, if requested by the Village, EPA will remove any structures, equipment, and improvements on the Property related to the remediation and restore it to its prior similar condition by EPA.

This consent shall have no effect on any claims by the Village for compensation for the activities performed by EPA on the Property.

EPA contractors maintain insurance, including commercial general liability and automobile liability insurance, as evidenced by the attached Certificate of Insurance, both of which are or will be maintained at all times that EPA and/or its contractors are performing the above responsive activities on the Property. In addition, EPA's contractor has added the Village as an additional insured to the contractor's commercial general liability and automobile liability insurance.

By my signature, I acknowledge that I am fully authorized to grant such access and that this written permission is given voluntarily with the knowledge of the right to refuse.

Robert J. Rothschild Date: August 28, 2009
Signature

ROBERT J. ROTHSCHILD
Printed Name

MAYOR
Title